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The subterranean organs of Helianthus scaberrimus

WILLIAM S. COOPER AND ABRAHAM D. STOESZ

(WITH TWO TEXT FIGURES)

The Rough Sunflower (*Helianthus scaberrimus* Ell.) is a widely distributed species of the northern prairies. A score of specimens in the herbarium of the University of Minnesota indicate for it a range bounded as follows: from western Indiana and central Minnesota to northwestern North Dakota and northern Oklahoma. Gray extends its northwestern limits to Saskatchewan, and Britton and Small both make it range southward to Georgia and Texas. In the vicinity of Minneapolis, where this study was made, it is a generally distributed, though rarely abundant, member of the tall bunch-grass community, which occurs in the main upon very sandy soils such as outwash and dune sand. Here it produces slender simple stems 30 to 100 cm. high, which bear one to several showy heads on long naked peduncles. The species was included in a research project, carried out by the junior author, dealing with the subterranean organs of local dune plants. In the investigation of this species, features of such unusual interest came to light that a special study was determined upon, the results of which are presented here.

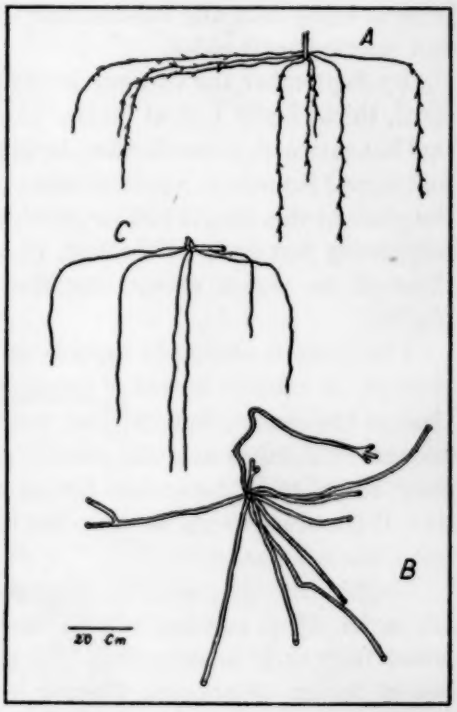

Fig. 1. Subterranean organs of *Helianthus scaberrimus*. *A*. Root system of mature shoot. *B*. Horizontal distribution of rhizomes from mature shoot. *C*. Root system of rhizome-bud in September.

The root system of a mature individual of *Helianthus scaberrimus* consists of a very few main elements, mostly adventitious in origin, simple, thick, white and succulent, with very few and scattered minute rootlets (fig. 1*A*). For the most part they extend horizontally for distances up to a

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meter, then turn abruptly downward, commonly reaching a depth of about 80 cm.

During the summer the plant produces from the base of the stem one to several rhizomes, which lie horizontally at a very constant depth of 6 to 8 cm. These are about 3 mm. in diameter. The longest of nearly 500 that were charted measured 102 cm. The greatest number produced by a single plant was 10 (fig. 1*B*). The rhizomes are very similar in appearance to the roots in being normally unbranched, smooth and fleshy, and they have few and inconspicuous nodes.

By September the rhizome is completely developed, and has a single erect, thick, fleshy bud at its tip. Occasionally we find that the terminal bud has met with some disaster, in which case its place is taken by a short bud-tipped branch, or a pair of them, from the next node back. The potential plant at this time is further provided with an independent root system, originating just back of the bud, consisting of several roots exactly like those of the parent except that they are absolutely devoid of rootlets (fig. 1*C*).

The plant is obviously capable of rapid multiplication and extension through its efficient means of propagation. The parent shoot dies at the close of the season, but its place may be taken next year by a group of several, established at quite considerable distances from the parent. The plant seems to be dependent almost entirely upon vegetative reproduction, if the seed, which we collected in hope of making experimental cultures, was a fair sample.

Occasionally the plant extends its sphere of influence in definite systematic order. Most striking was the discovery of a complete circle, a sunflower 'fairy ring,' in an ancient dune area called Bunker Prairie, five miles east of Anoka, Minnesota. Finding it first in the fall of 1927, we immediately determined to chart its limits and follow its development from year to year (fig. 2).

In November, 1927, the 'ring' was almost circular and 11 m. in average diameter. The belt of closely placed plants was 2 to 4 m. wide, and there was thus left an irregular central area, containing very few plants, 4–5 m. across. The outermost individuals were everywhere tall, many of them attaining heights of 60–90 cm.; they were thrifty and had flowered abundantly. Inward from the margin there was evident a progressive decrease in size, thriftiness and flowering, the innermost being sterile shoots 10–20 cm. high, bearing but two or three pairs of leaves.

For more detailed investigation, especially of the subterranean organs, a transect from center to outer margin, two meters wide, was laid out on a north-south line and marked with stakes. Within this area the position

of every sunflower plant was charted. The surface sand was then very carefully removed until the rhizomes were exposed. These also, with the next year's buds, were drawn in upon the chart. The excavation was done a little at a time and the soil carefully replaced, in order that a minimum of

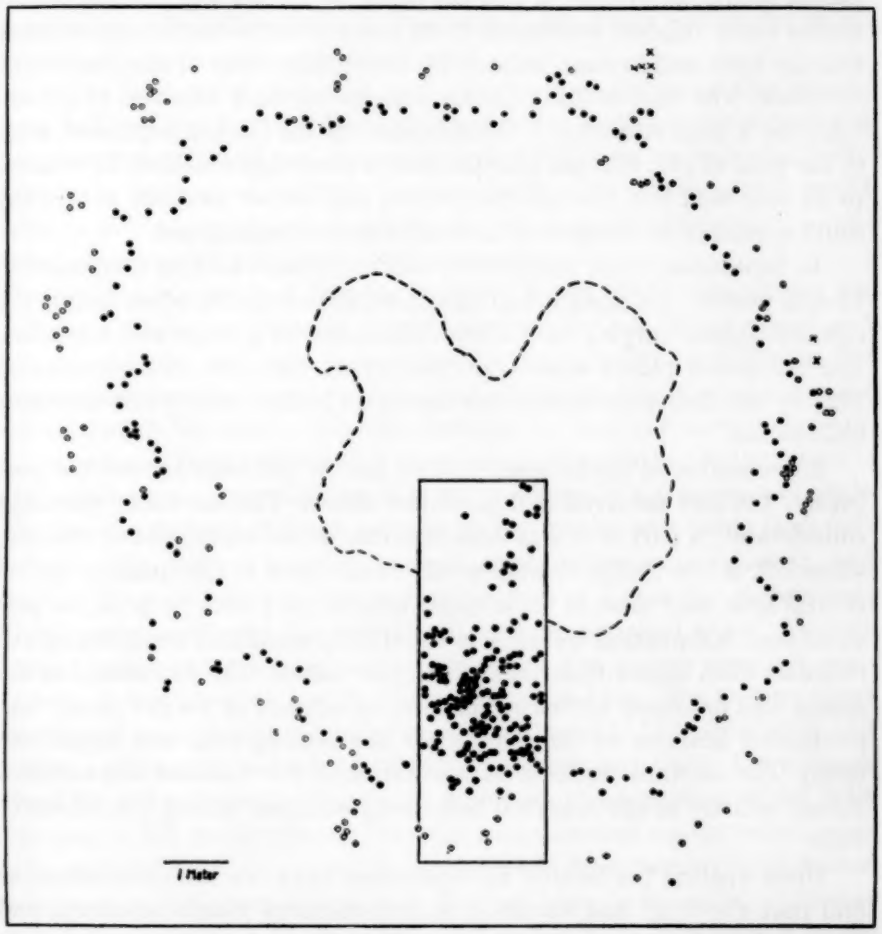

Fig. 2. 'Fairy ring' of *Helianthus scaberrimus*. Dots indicate outermost individuals in 1927, and all individuals of that year within transect; broken line marks inner boundary of thickly populated zone. Circles indicate outermost individuals in 1928; crosses, in 1929.

harm might be done to the buds. It was found that the outer strip characterized by tall plants was .6 m. wide; in this the average height was 55.7 cm. and the maximum 90 cm. In the remainder of the thickly populated belt (2.2 m. wide) the plants were more closely placed, but the average

height was but 23 cm. In that portion of the transect included in the sparsely inhabited central region the average height was 12.7 cm. The rhizomes made a dense tangle at the very constant depth at which they occurred. Two hundred and sixty-eight rhizomes had been produced by 173 parent shoots, an average of 1.55 per plant. In the densely populated zone almost every rhizome was traced to its parent; in the central region many healthy buds had become isolated by the rotting away of the connecting structure. The most striking feature was the outward direction of growth taken by a large majority of the rhizomes. In the thickly populated area, of the total of 192, 82.8 per cent pointed in directions southerly in relation to an east-west line through the parent, and 50 per cent lay within the south quadrant. In the central area this tendency was absent.

In September, 1928, the locality was revisited. The ring was found to be still perfect. Its margin had advanced at practically every point, the distance gained varying from a few centimeters to a meter and a quarter. The outermost plants were again the tallest, and the area occupied in 1927 by tall thrifty shoots was now inhabited by low, mostly non-flowering individuals.

Examination of the transect showed that of 245 buds formed the year before, 146 had survived and produced shoots. The mortality was thus considerable; a part of it was doubtless due to the excavation of the previous fall. A few thrifty flowering individuals grew in the sparsely settled central area, and most of these could be identified with buds of the previous year. Excavation revealed, in the thickly populated zone, a tangle of rhizomes even denser than that of the year before. The 146 shoots of the season had produced 350 new rhizomes, an average of 2.4 per plant. The predicated advance of the margin for the coming year was about one meter. The outward tendency in orientation of the rhizomes was confined almost entirely to the marginal belt newly occupied during the season of 1928.

Upon visiting the locality in September, 1929, we were astonished to find that the 'ring' had vanished. A few scattered plants remained, and two small groups occurred along the line where the advancing margin should have been. In the area of the transect, 8 scattered shoots, producing 11 rhizomes, were the only survivors of the 314 buds charted the year before.

This remarkable 'fairy ring' evidently originated from a single individual, or possibly from a very close group. Its age, assuming an annual advance of one meter, was six or seven years in 1928. Its symmetrical development was helped by the easy penetrability and uniformity of the sandy soil and the fewness of competing plants. The strong preponderance

of outward direction in the rhizomes may be due merely to a tendency to maintain the growth direction of the parent rhizome, traced back to the radially arranged rhizomes of the original parent. This is supported by the fact that in the area of the transect, in both years, the fewest rhizomes lay in the north quadrant, which faces the center of the ring. The absence of a dominating outward tendency in the central region may well be due to re-invasion by the inward-pointing minority.

It has been noted that each year the shoots at the advancing margin were tall and thrifty, that those growing in the region recently occupied were depauperate and non-flowering, and that the center was practically bare.[1] The presence of thrifty individuals in the central area in 1928 would seem to indicate amelioration, after a few years, of the unfavorable conditions associated with the presence of the sunflowers.

One possible cause of this phenomenon is less severe competition for soil water at the outer margin, where the plants are less closely spaced and entirely free on one side, in contrast to the crowded condition in the thickly populated zone just behind. Considering the ease of capillary water movement in the sandy soil, this explanation does not seem adequate. There remains the possibility of a chemical modification due to the plants—the abstraction or the addition of some substance. An attempt was made to solve the problem through greenhouse cultures in soils taken from outside the ring, zone of luxuriant growth, zone of depauperate growth, and center. Since we failed to find any viable seed of *Helianthus scaberrimus*, the common sunflower was substituted, and we also used wheat. Average height, green and dry weight were measured. The results were not sufficiently illuminating to justify full presentation here. One or two statements will be sufficient. Growing in soils gathered in 1927, sunflower and wheat cultures showed very satisfactory agreement. Using the cultures from the soil outside the ring as the standard, those growing in soil from the zone of tall sunflowers and from the center showed a great reduction in size, while those growing in soil from the zone of depauperate plants showed a marked increase over the controls. We thus have, in the main, an inverse correlation. Similar cultures in soils gathered in 1928 gave totally inconsistent results. These experiments would seem to point toward a chemical factor as the cause, but farther than that we cannot go.

The production of so perfect a ring as the one we have described is of course a rare occurrence, depending on the combined presence of a number of favorable factors. For the most part the species occurs as scattered indi-

[1] Dr. F. K. Butters, of this Department, states that the case is similar with an unidentified garden species of *Helianthus*, which absolutely requires new soil in order to produce satisfactory shoots and flowers.

viduals, which are in a state of constant migration. Each spring the developing bud finds itself in an area of fresh soil, with a fully developed root system ready for operation. In spite of the high mortality to which it is subject, it thus maintains itself as a constant and characteristic member of the prairie community.

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The relationships of certain myrmecophilous melastomes

H. A. Gleason

Myrmecophily, as evinced by the presence of hollow organs known as formicaria produced on some part of the leaves, has been developed among various genera of the Melastomataceae. These organs are usually inhabited by small biting ants and the plants are carefully avoided by the natives. Whether or not the presence of the ants is of any benefit or even of any significance to the plant is still open to question; perhaps the prevailing opinion is that it is not.[1] The existence of these structures has regularly been considered of taxonomic importance, and Cogniaux, in his monograph of the family, separated four genera on this feature alone, *Tococa*, *Microphysca*, *Myrmidone*, and *Maieta*. The present paper deals with the latter one alone.

Of these four, *Tococa* has a terminal inflorescence; *Microphysca* has a winged hypanthium; and *Myrmidone* is characterized by few and large seeds. In *Maieta* the inflorescence is axillary, the hypanthium not winged, and the seeds numerous and minute. Its species range in size from low shrubs to small but slender trees. Since they commence to flower at an early age, collections are usually made from the smaller plants where the flowers are more easily observed, and field notes generally indicate them as shrubs one to two meters high.

In the latest general treatment of the family (Monog. Phaner. **7**: 975–979. 1891) Cogniaux recognized eight species and one variety. The discovery of these plants had progressed during more than a century of botanical exploration in tropical America and the dates when each was first described are as follows:

1. *Maieta guianensis* Aubl. 1775.
2. *M. heterophylla* (Desr.) DC. 1796.
3. *M. Poeppigii* Mart. 1823.
4. *M. tococoidea* (DC.) Cogn. 1828.
5. *M. vesiculosa* (DC.) Cogn. 1828.
6. *M. setosa* (Triana) Cogn. 1867.
7. *M. dentata* (Triana) Cogn. 1871.
8. *M. testiculata* (Triana) Cogn. 1871.
9. *M. tococoidea* var. *Watsonii* Cogn. 1891.

All of these passed through various changes of names or received some synonyms before they were finally brought together in one genus by Cogni-

[1] For a recent study of myrmecophily in the related genus *Tococa*, with an excellent general discussion and bibliography, see Douglas Melin, Contributions to the study of the theory of selection I. Zool. Bidr. Uppsala **13**: 87–104. *f. 1–3.* 1930.

aux, except the third, which was not actually given a name until 1871, and the last. These are specified in detail under each species in the taxonomic treatment below.

Since 1891 the botanical exploration of tropical America has proceeded rapidly and other species have been added to the genus:

10. *M. juruensis* Pilger. 1905.
11. *M. guianensis* var. *peruviana* (Cogn.) Ule. 1908.
12. *M. robusta* Rusby. 1920.
13. *M. glandulifera* Standley. 1924.
14. *M. hispida* Rusby. 1927.
15. *M. cuneata* Standley. 1930.

While *Maieta*, as recognized by Cogniaux, has a botanical history extending back almost to Linnaean times, it has not always included all the species assigned to it by Cogniaux. For more than half a century it was a competitor with De Candolle's genus *Calophysa*, which indeed came to be much the larger of the two, until the latter was finally suppressed by Cogniaux. Our next tasks are therefore to determine whether all the species at present described under *Maieta*, in the sense of Cogniaux, are rightfully of that genus, and then to discuss the wisdom of the merging of *Maieta* with *Calophysa*, after these two genera had been considered distinct by such eminent students of the family as De Candolle, Naudin, and Triana.

The following species are to be reduced, excluded, or transferred to another genus.

5. MAIETA VESICULOSA (DC.) Cogn. Fl. Bras. **14**[4]: 463. 1888. *Tococa vesiculosa* DC. Prodr. **3**: 166. 1828. *Calophysa vesiculosa* Triana, Trans. Linn. Soc. Bot. **28**: 140. 1871.

The species was founded by the author on an illustration of a Mexican plant by Moçino and Sessé and was regarded by him originally as a more or less doubtful species. Dr. John H. Barnhart supplies the information that the plates of which this was one were the property of the Spanish government and on loan to De Candolle. Their return being peremptorily demanded, De Candolle secured the voluntary assistance of a number of ladies of Geneva, who made copies of them; reproductions of these copies were afterward published. De Candolle's brief description of the species is apparently taken from the copy, or at least agrees well with it. Whether the copy is a faithful duplicate of the original, or whether the original accurately represents the plant, is at present unknown. The plant distinctly shows a 5-merous flower, which alone is enough to distinguish it from *M. setosa*, in addition to the other points mentioned by Triana (loc. cit.). It is probable that the plate represents a *Tococa*, possibly like *T. Peckiana* Robinson.[2]

9. MAIETA TOCOCOIDEA (DC.) Cogn. var. WATSONII Cogn. Monog. Phaner. **7**: 979. 1891. The Central American specimens of this species, upon which the varietal name was based, differ only in small particulars from the type and in my opinion do not require special designation.

11. MAIETA GUIANENSIS Aubl. var. PERUVIANA (Cogn.) Ule, Notizbl. **6**: 368. 1915. (*Myrmidone peruviana* Cogn. Engl. Jahrb. **42**: 147. 1908.) The variety is distinguished by unimportant characters and does not deserve even varietal status.

12. MAIETA ROBUSTA Rusby, Descr. S. Am. Pl. 72. 1920. Examination of the type in the herbarium of the New York Botanical Garden shows that it is *Tococa macrophysca* Spruce.

13. MAIETA GLANDULIFERA Standley, Proc. Biol. Soc. Wash. **37**: 52. 1924. Examination of the type in the National Herbarium shows that it is of the genus *Tococa* and possibly close to *T. Peckiana* Robinson.

14. MAIETA HISPIDA Rusby, Mem. N. Y. Bot. Gard. **7**: 315. 1927. The type specimen, in the herbarium of the New York Botanical Garden, is clearly *Maieta guianensis* Aubl.

15. MAIETA CUNEATA Standley, Field Mus. Bot. Ser. **8**: 30. 1930. The type, in the herbarium of the Field Museum, has a densely hirsute stem somewhat suggestive of *M. setosa* (Triana) Cogn. The short petioles and general contour of the leaf give it the aspect of a *Henriettea*, but the petals are acute and inflexed at the tip, with an erect dorsal spur, while the anthers are stoutly oblong, not at all tapering to the tip, and distinctly suggesting *Henriettella* in their structure. There seems to be no reason for assigning the plant to *Maieta* except the presence of axillary flowers and formicaria. The former are found in a number of genera in the same tribe of the family and formicaria are known not only from *Maieta* and its immediate relatives, but also from *Tococa* and *Ossaea*. I accordingly give this plant the name **Henriettella cuneata** (Standl.).

The genus *Maieta*, as understood by Cogniaux, is therefore left with eight species, to which I shall below add three others.

Calophysa, as originally established by De Candolle, was characterized by 4-merous flowers, in contrast to the 5-merous flowers of *Maieta*. The original species had formicaria and this was probably also of some weight in leading the author to its differentiation. Since so many genera of melastomes have both 4-merous and 5-merous flowers, as *Tibouchina*, *Miconia*, and *Clidemia*, we can scarcely consider this feature of generic importance. Naudin discovered a point of greater significance, the anthers of *Maieta*

[2] *Tonduz 9397*, from Talamanca, Costa Rica (probably now in Panama) was identified as this species by John Donnell Smith. The specimen in his collection, now in the National Herbarium, is sterile, but is clearly a *Tococa*.

being bifurcate at base; he also mentions that the base of the hypanthium in *Calophysa* becomes swollen at maturity below the comparatively narrow neck, and that the stigma is punctiform rather than peltate. Triana extended the scope of the genus considerably. He admitted that it is difficult to characterize and that some of its species resemble *Clidemia*, although their oblong calyx and general habit suggest an affinity with *Maieta*. The presence of formicaria was not a decisive feature with Triana: of his ten species four were without them and these four were later transferred by Cogniaux to *Clidemia*.

Since the careful studies of staminal structure in this family have shown that these organs are generally the best index to generic relations, it will be advisable to see if such characters may be found to separate the two genera. In *Maieta guianensis*, which typifies the genus, the anthers are rather abruptly bent near the middle and above the bend flattened tangentially to a broadly rounded summit which bears the pore on the dorsal side; toward their base the filament leaves the connective with a curve away from the dorsal side, and the thecae are distinctly prolonged below this point into two basal spurs. These projections must be distinguished from appendages on the connective itself, which are not found in *Maieta* but are characteristic of many other genera in the family. In *Calophysa*, as defined by Triana, the anthers taper to a fairly acute tip and bear the small pore exactly on the end or somewhat toward the ventral side; they are not bifurcate or appendaged in any way at the base, the connective and thecae ending at the insertion of the filament, or the former is somewhat continued as a depressed-conic prolongation to the summit of the filament. This distinction, first shown by Naudin, seems to be of some importance. In *M. guianensis*, also, the anther-sacs are extraordinarily convoluted, the walls on both lateral surfaces of each sac being alternately inflexed almost to the opposite side, while in *Calophysa* they are entire or merely crenulate, in the latter case suggesting that the growth of the thecae has been somewhat greater than that of the connective. Searching for further characters, we find that the flowers of *M. guianensis* are subtended by a calyculus of broad bracts, which are absent in *Calophysa;* the style of the former is very stout with a broadly peltate stigma, of the latter filiform with a capitate or truncate stigma; the flowers of the former are 5-merous, of the latter (with some exceptions) 4-merous; the formicaria of the first are epiphyllous, of the latter usually petiolar. For these reasons it seems advisable to remove from *Maieta* those species placed by Triana in *Calophysa* and the one accepted species described more recently, leaving the genus *Maieta* for *M. guianensis*, its type, and a single other closely related species.

No one can fail to be impressed, as was Triana, with the striking sim-

ilarity in habit between *Calophysa* and certain species of *Clidemia*. *Clidemia ciliata* Don and *Maieta testiculata* Cogn. (*Calophysa testiculata* Triana) are in fact so similar that they may easily be mistaken one for the other, if the obscure formicaria of the latter are not observed, and the chief difference, without dissection, is the stellate pubescence on the lower side of the leaves in the former and the pilose pubescence of the latter. The anthers of the two are strikingly similar.

I accordingly agree with Triana in uniting in the same genus certain species now placed partly in *Maieta* and partly in *Clidemia*, and with Cogniaux in believing that *Calophysa* can not be maintained as an independent genus. Ten of the twelve species named below are accordingly placed in *Clidemia*. The presence of dimorphic leaves in some of them can not be urged as an objection, since *Clidemia dispar*, *C. flexuosa*, and several others exhibit them.

In the taxonomic treatment below, the location of cited specimens in herbaria is designated by initials only:

Botanisches Museum, Berlin (B)
Conservatoire Botanique, Geneva (C)
Field Museum, Chicago (F)
Gray Herbarium, Cambridge (G)
Royal Botanic Gardens, Kew (K)
National Herbarium, Washington (N)
New York Botanical Garden (Y)

I am grateful to the administrative officers of each of these institutions for the opportunity to examine the material under their charge, either by loan or in residence.

Anthers bifurcate at base, the thecae greatly convolute; flowers or inflorescence subtended by ovate to lanceolate bracts; style very stout, 1–1.3 mm. in diameter, the stigma broadly peltate; formicaria wholly epiphyllous.....*Maieta* Aubl.

Anthers simple at base, the thecae entire or crenulate; bracts setaceous; style slender, generally less than 0.5 mm. in diameter, the stigma capitate or truncate; formicaria mostly petiolar.....*Clidemia* Don (in part).

MAIETA Aubl. Pl. Guian. 1: 443. 1775

Shrubs or small trees with strongly dimorphic leaves, the larger member of each pair bearing a formicarium; flowers solitary and sessile to few and short-peduncled, in the axils of the leaves; stem and foliage hirsute or pilose. Flowers 5-merous; hypanthium obconic to campanulate, glandular-hirsute; sepals semicircular, with erect, subulate or slenderly conic exterior teeth; petals obovate, obscurely and broadly clawed; stamens isomorphic; ovary half-inferior, the conic summit setose at the tip.

Flowers 1–3; peduncle and pedicel none and each flower closely subtended by 4 broadly ovate, more or less setose bracts; petiole hirsute or somewhat tomentose above ..... 1. *M. guianensis.*

Flowers few and peduncled, each pair of ovate or lanceolate, stellate-pubescent bracts distinctly separate from the others; petiole densely tomentose in a narrow strip on the dorsal side..... 2. *M. Poeppigii.*

1. MAIETA GUIANENSIS Aubl. Pl. Guian. **1:** 443. 1775

Melastoma maieta Desr. Lam. Encyc. **4:** 34. 1796.
Tococa Mayeta Don, Mem. Wern. Soc. **4:** 305. 1823.
Maieta hypophysca DC. Prodr. **3:** 166. 1828.
Majeta dispar Miq. Linnaea **18:** 277. 1844.
Myrmidone peruviana Cogn. Engl. Jahrb. **42:** 147. 1908.
Maieta guianensis Aubl. var. *peruviana* (Cogn.) Ule, Notizbl. **6:** 368. 1915.
Maieta hispida Rusby, Mem. N. Y. Bot. Gard. **7:** 315. 1927.

Common and widely distributed through the Amazonian lowlands and adjacent regions from French Guiana to Bolivia and southeastern Colombia; also in Trinidad (*fide* Cogniaux) and along the shore of Venezuela at least as far west as Caracas.

FRENCH GUIANA—Maroni: *Melinon 162* (F, K, N), *291* (F, N), *291 bis* (F), in 1862 (Y), in 1864 (F, K, N, Y). Acarouany: *Sagot* in 1854 (Y). Godebert: *Wachenheim 130* (K, N). Without locality: *Poiteau* (B, K); *Sagot 235* (K).

BRITISH GUIANA—Potaro River: *Jenman 1283* (K). Kotinang River: *Altson 465* (K). Without data (Y).

SURINAM—Without locality: *Splitgerber* (K).

VENEZUELA—Caracas: *Lockhart* (K).

COLOMBIA—Río Ortaguaza, terr. Caquetá: *Woronow & Juzepczuk 6150* (Y).

BRAZIL—Near Belem, Pará: *Becquaert "Tococa no. 8"* (G), *Becquaert* without number (G). Cultivated at Rio Janeiro: *Glaziou 9818* (K). Near Manáos: *Gwynne Vaughan 7b* (K). Near Taruma: *Traill 309* (or *304*) (G, K). Fonteboa: *Traill 308* (K). Fortaleza, Rio Jurua: *Ule 5913* (B, K). Jurua Miry: *Ule 5550* (B). São Gabriel: *Spruce 2163* (B, G, K). Near Barra on the upper Rio Negro: *Spruce 2163* (Y), *Spruce* without number (K).

PERU—Serra de Escabo: *Ule 20p* (B). Dept. Loreto, Balsapuerto: *Killip & Smith 28407* (Y); Caballo-cocha: *Williams 2351* (Y); above Iquitos: *Tessmann 4561* (B); La Victoria: *Williams 2563* (Y), *2718* (Y); Mishuyacu: *Killip & Smith 29983* (Y); Pebas: *Williams 1623* (Y); San Antonio: *Killip & Smith 29509* (Y); Soledad: *Killip & Smith 29760* (Y); Tierra Doble: *Williams 1069* (Y); Timbuchi: *Williams 947* (Y). Dept. Junín, Cahuapanas: *Killip & Smith 26779* (Y); Puerto Bermudez: *Killip & Smith 26544* (Y), *26551* (Y); Santa Rosa, Pichis Trail: *Killip & Smith 26151* (Y). Dept. San Martín, Mount Guayrapurima; without other data, probably Spruce (K); Tarapoto: without data, probably Spruce (K).

BOLIVIA—Tumapasa: *White 1839* (Y).

2. MAIETA POEPPIGII Mart. ex Triana, Trans. Linn. Soc. Bot. **28**: 141. 1871

Tococa Mayeta Don, Mem. Wern. Soc. **4**: 305. 1823, *in part.*

The species closely resembles the preceding, but may usually be distinguished by its broader, more abruptly acuminate large leaves and its subrotund small leaves, as well as by the more accurate characters stated in the key. The specimens from Cocos Island more closely resemble *M. guianensis* in foliage and have shorter peduncles than the type, but do not appear to be distinct.

BRITISH GUIANA—Kangaruma: *Gleason 182* (K, N, Y). Rockstone: *Gleason 686* (N, Y).

BRAZIL—Rio Pará: *Poeppig* without number, probably type collection (B). Puritizal: *Ule 5667* (B). Jurua Miry: *Ule 5449* (B, K).

PERU—Amazon River: *Poeppig 3025* (B). Pueblo Nuevo: *Ruiz* (B). Dept. Loreto, La Victoria: *Williams 2545* (Y), *2717* (Y); Manfinfa: *Williams 1169* (Y); Pebas: *Williams 1571* (Y), *1689* (Y); Santa Ana: *Williams 1239* (Y). Dept. Junín, Puerto Bermudez: *Killip & Smith 26432* (Y).

COSTA RICA—Cocos Island: *Pittier 12374* (G, N), *16225* (B, G); *Svenson 401* (Y).

CLIDEMIA Don, Mem. Wern. Soc. **4**: 306. 1823

The description and key apply to the myrmecophilous species only. About a hundred other species, of diverse structure and habit, occur in tropical America and constitute a polymorphic group which may eventually need segregation or division among other genera.

Shrubs or small trees with isomorphic or somewhat dimorphic leaves, the larger or both bearing a formicarium in most cases; flowers in peduncled clusters from the axils of the leaves; stem and foliage more or less hirsute or pilose. Flowers 5-merous (with one exception); hypanthium tubular or somewhat cylindric, often ampliate at the base, glabrous or hirsuite; sepals with stout, erect or spreading exterior teeth; petals obovate-oblong, mostly retuse; stamens isomorphic; ovary half to wholly inferior.

Formicaria pendent on the stem at the base of the petiole; leaves broadly cordate-ovate, 7–9-nerved, serrulate, short-acuminate, freely pubescent on both sides; flowers 4-merous; hypanthium narrowly campanulate; exterior calyx-teeth suberect or nearly horizontal; petals less than 3 mm. long; connective not prolonged at base; ovary 4-celled.

Leaves cordate-clasping, nearly or quite sessile; hypanthium freely setose.

Pubescence of the lower leaf-surface of simple bristles.....1. *C. testiculata.*

Pubescence of the lower leaf-surface and stem wholly or chiefly of stellate hairs .....2. *C. ciliata.*

Leaves with petioles 3–8 cm. long; hypanthium minutely pubescent, usually not setose.....3. *C. tococoidea.*

Formicaria at the summit of the petiole or on the blade; connective often shortly prolonged at base.

Free petiole below the formicarium much longer than the formicarium itself, usually 2–8 cm. long; leaves rounded to cordate at base, nearly or quite isomorphic; stem, petiole, and inflorescence densely setose with stiff, slender, yellowish, reflexed or spreading bristles 8–15 mm. long; flowers 4–5-merous; hypanthium nearly or quite glabrous; calyx-tube setose; flowers in long-peduncled, freely branched clusters.

Formicaria wholly petiolar; leaves oval or broadly elliptic, more than half as wide as long, 7–9-nerved; pubescence beneath the setae of the stem, petioles, and inflorescence essentially none; flowers 4-merous.....4. *C. setosa.*

Formicaria mostly or wholly epiphyllous; leaves pli-nerved; petioles and inflorescence distinctly pubescent beneath the setae; leaves pubescent on the veins beneath.

Formicaria mostly on the blade; leaves elliptic-oblong, less than half as wide as long, 5-pli-nerved, flat; calyx-tube sparsely short-setose; flowers 4-merous .....5 *C. pubescens*

Formicaria wholly epiphyllous; leaves broadly elliptic, more than half as wide as long, 7-pli-nerved, heavily bullate; calyx-tube setose with hairs 8–9 mm. long; flowers 5-merous.....6. *C. spectabilis.*

Free petiole below the formicarium short or none and always shorter than the formicarium itself; leaves cordate or acuminate at base, isomorphic or dimorphic; stem hirsute with much shorter and spreading bristles; flowers 4–5-merous in dense or freely branched clusters; hypanthium and calyx-tube hirsute or merely stellate.

Leaves isomorphic, obovate, distinctly cuneate at base above the petiolar formicarium; flowers 5-merous; hypanthium densely hirsute with simple and glandular hairs; exterior calyx-teeth erect; ovary 3-celled, half-inferior, the free summit densely setose.....7. *C. juruensis.*

Leaves strongly dimorphic, the larger inequilateral at the rounded base, 5–7-pli-nerved; formicaria partly epiphyllous; flowers 5-merous; exterior calyx-teeth erect, sparsely setose; hypanthium minutely stellate, not setose..8. *C. foliosa.*

Leaves strongly dimorphic, cordate at base, narrowly oblong-elliptic, 3–5-nerved; formicaria wholly petiolar; flowers 4–5-merous; exterior calyx-teeth spreading horizontally; ovary nearly or wholly inferior, tipped with a short beak.

Flowers 5-merous; ovary 5-celled; hypanthium and exterior calyx-teeth glandular-hirsute.....9. *C. heterophylla.*

Flowers 4-merous; ovary 4-celled; hypanthium and exterior calyx-teeth thinly and minutely stellate.....10. *C. Sprucei.*

1. **Clidemia testiculata** (Triana) comb. nov.

Calophysa testiculata Triana, Trans. Linn. Soc. Bot. **28:** 140. 1871.
Maieta testiculata Cogn. Fl. Bras. **14**[4]**:** 463. 1888.

The formicaria are small and often hidden by the bases of the sessile leaves, or may be absent completely, as in *Killip & Smith 15086*. The type is *Triana 3938*, of which I have examined two specimens; it differs in no essential features from the other sheets cited.

VENEZUELA—Merida: *Moritz 945* (B, K, N, Y); *Pittier 12744* (Y), *12806* (Y).

COLOMBIA—Buena Vista, near Ocaña: *Ariste-Joseph* (N). Dept. Cundimarca, Susumuco, near Bogota: *Triana 3938* (C, K). Dept. El Valle, Pavas: *Pennell 5518* (Y). Dept. Santander, Mesa de los Santos: *Killip & Smith 15086* (Y).

PERU—Dept. Junín, Dos de Mayo: *Killip & Smith 25798* (Y).

COSTA RICA—Canas Gordas: *Pittier 10960* (F, N); Llanuras de Santa Clara: *Smith 6562* (F, G, K, N); without locality: *Lankester K 114* (K), *298* (K).

2. CLIDEMIA CILIATA Don, Mem. Wern. Soc. **4:** 309. 1823

Calophysa ciliata Triana, Trans. Linn. Soc. Bot. **28:** 140. 1871.

Although the type collection is from Peru, there is no doubt that the plants from Venezuela and Colombia are conspecific. Formicaria are usually not produced and have been noted only on *Pittier 9830*, where they have the usual didymous form and are thinly stellate and sparsely hirsute.

PERU—Chicoplaya: *Ruiz* (isotype, B). Dept. Ayacucho, Aina: *Killip & Smith 22704* (Y).

BOLIVIA—Yungas: *Bang 448* (Y). Nord Yungas: *Buchtien 3864* (Y).

COLOMBIA—Santa Marta: *H. H. Smith 2517* (Y).

VENEZUELA—Near Caracas: *Pittier 9830* (Y); *Allart 17* (Y); *Woronow 7439* (Y).

3. **Clidemia tococoidea** (DC.) comb. nov.

Calophysa tococoidea DC. Prodr. **3:** 166. 1828.
Maieta tococoidea (DC.) Cogn. Fl. Bras. **14[4]:** 465. 1888.
Maieta tococoidea var. *Watsonii* Cogn. Monog. Phaner. **7:** 979. 1891.

De Candolle does not cite the type definitely, merely stating that he saw specimens in the herbarium at Paris. Cogniaux mentions a collection of Bonpland, which is probably the type, as it is the only one cited which antedates the Prodromus.

The plants from north of Panama are much hairier and have leaves somewhat larger and proportionately broader, with 7–9 primaries; these were distinguished as a variety by Cogniaux. In all the Amazon sheets except *Ule 5828*, glandular pubescence is lacking and the hypanthium is free from setae. In this one collection the stem, petioles, formicaria, inflorescence, and hypanthium are glandular-hirsute, while the exterior teeth, so conspicuously setose in the others, are here minutely stellate with a single terminal bristle.

BRAZIL—Barcellos: *Traill 304* (K); Jurua Miry: *Ule 5828* (B, K); San Joaquim: *Ule 6048* (B, K); along the Rio Negro: *Spruce 2032* (B, C, K, Y).[3]

[3] Spruce had a habit of collecting under the same number specimens from widely separate localities and widely different dates. Sometimes these discrepancies were obscured by the provision of a uniform herbarium label and sometimes further confused by different herbarium labels for the same thing. The number here cited was collected

PERU—Maynas: *Poeppig 1794* (B).

PANAMA—Cricamola Valley: *Cooper 480* (F, Y).

COSTA RICA—Prov. Talamanca, Tsâki: *Tonduz 9597* (F, N); Zhorquin: *Tonduz 8575* (N).[4]

BRITISH HONDURAS—Middlesex: *Schipp 470* (G).

4. **Clidemia setosa** (Triana) comb. nov.

Calophysa setosa Triana, Jour. Bot. **5**: 209. 1867.
Maieta setosa (Triana) Cogn. Fl. Bras. **14**[4]: 462. 1888.

While the structure of the flowers and the general facies is quite uniform, the amount and distribution of the pubescence varies greatly. On the stem and petioles the hairs are always long, copious, and reflexed; the leaves range from glabrous to densely hirsute on either surface. The species is based on a collection of Seemann from Nicaragua, which I have not seen. The description is so plain and the usage of later students so definite that there is no doubt concerning the application of the name.

MEXICO—Vera Cruz, Chinantla: *Galeotti 2963* (B); Misantla: *Hahn* (K). Oaxaca, Lacoba and Teotalcingo: *Liebmann 35* (G, K, N). Chiapas, Finca Mexiquito: *Purpus 6778* (F, G, N, Y).

GUATEMALA—Chahná: *Johnson 466* (N); San Cristobal: *Tejada 245* (N). Dept. Huehuetenango, Huehuetenango: *Tejada 334* (N). Dept. Alta Verapaz, Cubilquitz: *Türckheim 7865* (B, F, G, K, N, Y), *II 411* (N); Finca Sepacuite: *Cook & Griggs 184* (N), *480* (N); Trece Aguas: *Cook & Doyle 15* (F, N); Pansamalá: Türckheim 991 (B, G, K, N, Y). Eastern portions of Vera Paz and Chiquimula: *Watson 227* (G).

BRITISH HONDURAS—Belize: *Cook & Martin 23* (N).

HONDURAS—Coyol: *Carleton 506* (N). Dept. Atlántida, near Tela: *Standley 56753* (F).

COSTA RICA—Forêts de Tuis: *Tonduz 8284* (N). Prov. Guanacaste, Los Ayotes: *Standley & Valerio 45341* (N). Prov. San José, La Hondura: *Standley 37597* (N); forêts de Las Vueltas: *Tonduz 13124* (B, F, N). Prov. Cartago, El Muñeco: *Standley 33647* (N); Pejivalle: *Standley & Valerio 47154* (N).

5. **Clidemia pubescens** sp. nov.

Caule gracile cum petiolis et inflorescentia tenuiter pubescente et longe setoso pilis flavidis patulis vel reflexis; petiolis brevibus vel elongatis; formicariis epiphyllis semiovoideis paulum setosis vel glabris; laminis membranaceis elliptico-oblongis saepe falcatis abrupte breviterque acuminatis basi rotundatis vel subcordatis supra glabris vel setis paucis inspersis, subtus ad venas venulasque pubescentibus ad basin venarum primariarum breviter setosis; inflorescentia parva pauciflora longe pedunculata; floribus 4-meris; hypanthio fructifero subglabro; calycis tubo parce setoso; ovario 4-loculare.

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in at least three places, on the Rio Negro below Barcellos, on the same river above the mouth of the Casiquiare, and at Piedra de Capibara on the Rio Casiquiare.

[4] The old province of Talamanca in Costa Rica no longer exists and the southern part of its original territory now lies in Panama. The collection cited and probably most of Tonduz' other collections in this genus came from the transferred area.

Stems woody, thinly pubescent and also freely setose when young with stiff, slender, yellowish hairs as much as 10 mm. long, the same indument covering the petioles and inflorescence; petioles slender, 2—7 cm. long; formicaria on the base of the blade, semi-ovoid, 10—15 mm. long, conspicuously 2-lobed, glabrous or sparingly setose; blades membranous, elliptic-oblong, often somewhat falcate, as much as 15 by 6.5 cm., abruptly short-acuminate, nearly entire, finely ciliate, rounded or subcordate at base, apparently glabrous above, but actually with a few long setae 10–15 mm. apart in the distal half, finely pubescent beneath on all the veins and veinlets, setose on the primaries near the base, 5-pli-nerved; peduncle elongate, slender, terminated by a few-flowered cyme; flowers 4-merous; fruiting hypanthium globose, glabrous; calyx-tube sparsely setose; ovary 4-celled.

The plant apparently does not reach a great size, one specimen having bloomed at a height of only 25 cm.

Costa Rica—Forêts de la Boca de Zhorquin, Prov. Talamanca (now in Panama, Dept. Bocas del Toro): *Tonduz 8574*, type (and only fertile specimen examined) in the National Herbarium, no. 1361798, isotype in Field Museum, no. 576466; près du ruisseau de Kitadiku, Talamanca: *Tonduz 9377* (F, N).

6. **Clidemia spectabilis** sp. nov.

Caule herbaceo longissime setoso pilis flavidis patulis; petiolis brevibus dense setosis; formicariis epiphyllis parvis; laminis late ellipticis abrupte acuminatis basi rotundatis 7-pli-nerviis supra crasse bullatis setosisque subtus ad venulas pubescentibus ad venas pubescentibus et setosis; inflorescentia densa multiflora pedunculata setosa, bracteis setaceis elongatis; floribus pedicellatis 5-meris; hypanthio campanulato breviter villoso; sepalis ovatis obtusis, dentibus exterioribus sepala duplo excedentibus subulatis setosis; calycis tubo longissime setoso; staminibus isomorphis, antheris oblongis lateraliter complanatis poro terminale dehiscentibus; ovario infero 5-loculare rostro brevissimo coronato.

Stem slender, herbaceous, densely covered with slender, yellowish, spreading bristles as much as 15 mm. long; leaves isomorphic; petioles 1–2 cm. long, setose like the stem; formicaria epiphyllous, densely setose, about 1 cm. long; blades firm, broadly elliptic, 20 cm. long, 17 cm. wide, abruptly short-acuminate, nearly entire, rounded at base, 7-pli-nerved, heavily bullate above, each conic projection tipped with a slender seta 8–10 mm. long, deeply foveolate beneath, villous-pubescent with short hairs on the tertiaries, setose on the primaries and secondaries with hairs up to 8 mm. long, underlaid by short villous hairs; inflorescence from the upper axils, many-flowered, compact, the peduncle 3 cm. long, densely pubescent with slender hairs 2 mm. long and also densely long-setose, pedicels 2.5 mm. long; flowers 5-merous; hypanthium campanulate, 3 mm. long to the torus, densely villous with fine crooked hairs 0.4 mm. long; calyx-tube prolonged 0.7 mm., somewhat flaring, pubescent

like the hypanthium and also with 15–20 slender setae 8–9 mm. long; sepals ovate, obtuse, 0.7 mm. long, finely glandular-ciliate; exterior teeth stoutly subulate, 2 mm. long, villous at base and with 3 or 4 long setae; petals elliptic, 5–6 mm. long; stamens isomorphic; filaments flat, glabrous, 2 mm. long; anthers stoutly oblong, 2 mm. long, laterally flattened, opening by a terminal pore; connective neither appendaged nor prolonged, but elevated into a low dorsal ridge near the base; ovary wholly inferior, 5-celled, its summit prolonged into a short glabrous beak; style slender, 6.5 mm. long; stigma capitate.

COSTA RICA—El Muñeco, alt. 1500 m.: *Stork 2717* (type in Field Museum, no. 598560).

'Herb on deep forest floor, conspicuous for its extreme hirsuteness. Fruits cerulean blue.'—Stork. It resembles *C. setosa* in general habit but may be distinguished at a glance by its remarkably bullate leaves, as well as the other more technical characters mentioned in the key.

7. **Clidemia juruensis** (Pilger) comb. nov.[5]

Maieta juruensis Pilger, Verh. Bot. Ver. Brandenb. **47**: 178. 1905.

The isomorphic, obovate leaves, long cuneate at base to a nearly sessile formicarium, give it an aspect quite unlike the other myrmecophilous species of the genus and suggesting rather a relation to *Tococa*. The axillary flowers and the form of the stamens are nevertheless typical of *Clidemia*.

BRAZIL—Jurua Miry: *Ule 5449* (type, B, K).

PERU—Dept. Loreto, Catalina on the Río Ucayali: *Huber 1511* (N); Santa Rosa: *Killip & Smith 28754* (Y).

8. **Clidemia foliosa** sp. nov.

Ramis gracilibus minute stellatis et longiore glanduloso-hirsutis; petiolis brevibus dense stellatis sparse glandulosis; formicariis semi-ovoideis partim ad petiolum partim ad laminam adnatis hirsutis dorso foliolis paucis ornatis; laminis anguste ellipticis acuminatis crenulatis ad basin inaequilateralem obtusis 5—7-pli-nerviis, venis in quoque jugo alternatim orientibus, utrinque pilosis; inflorescentia parva ramosa glanduloso-pilosa, bracteis setaceis elongatis; floribus 5-meribus sessilibus; hypanthio tubuloso minute stellato; dentibus exterioribus lineari-subulatis hypanthium aequantibus pilis glandulosis perpaucis inspersis.

Stems slender, minutely stellate and freely glandular-hirsute; large leaves: free petioles about 1 cm. long, rather densely stellate and sparsely glandular; formicaria semi-ovoid, 3—4 cm. long, of which the basal 5—10 mm. is entirely on the petiole, the distal portion extending up the blade to the base of the uppermost primaries, very sparsely and minutely stellate, freely glandular-

[5] In my opinion, the use of this specific name is not invalidated by the earlier publication of *Clidemia juruana* Ule.

hirsute, bearing along the dorsal median line 2—6 lanceolate or oblong leaflike appendages, each 2—6 mm. long; leaf-blades thin, narrowly elliptic, as much as 6 by 15 cm., abruptly acuminate, finely crenulate, obtuse or rounded at the inequilateral base, where one side is 3—8 mm. longer than the other, 5—7-plinerved, all except the upper pair of laterals more or less alternate, rather sparsely setose on both sides; small leaves: petioles 3—5 mm. long; formicaria none; blades ovate, 1—2 cm. long by two thirds as wide, cuspidate-acuminate, broadly rounded at base, 3-nerved; inflorescence (very immature) a small few-flowered panicle, glandular-hirsute and sparsely stellate; bracts setaceous, 2—4 mm. long; flowers 5-merous, sessile; hypanthium tubular, minutely stellate; exterior teeth linear-subulate, as long as the hypanthium, with a few long glandular hairs on each.

PERU—Dept. Loreto, Timbuchi on the Río Nanay: *Williams 933* (type in the herbarium of The New York Botanical Garden); Tierra Doble on the Río Nanay: *Williams 1058* (N).

9. **Clidemia heterophylla** (Desr.) comb. nov.[6]

Melastoma heterophylla Desr. Lam. Encyc. **4:** 34. 1796.
Tococa heterophylla Don, Mem. Wern. Soc. **4:** 305. 1823.
Calophysa heterophylla Triana, Trans. Linn. Soc. Bot. **28:** 140. 1871.
Maieta heterophylla DC. Prodr. **3:** 166. 1828.

PERU—Chicoplaya: *Ruiz* (B); Maynas Altas (probably Dept. San Martín): *Poeppig* without number (B).[7] Dept. Huanuco, between Monzon and Huallaga: *Weberbauer 3632* (B), *3665* (B), *3681* (B, N). Dept. Junín, Cahuapanas: *Killip & Smith 26774* (Y). Dept. Loreto, Balsapuerto: *Killip & Smith 28575* (Y), *28482* (Y).

10. **Clidemia Sprucei** nom. nov.

Calophysa dentata Triana, Trans. Linn. Soc. Bot. **28:** 140. 1871.
Maieta dentata (Triana) Cogn. Fl. Bras. **14**[4]**:** 465. 1888.

Triana cited originally two collections, *Spruce* 4441 and *Lechler* 2306, but only a single locality 'in montibus secus flumen Mayo prope Tarapoto Peruviae orientalis.' Since this corresponds to the locality of the Spruce collection, that plant is accepted as the type. The use of the original specific name is prevented by the earlier *C. dentata* Don.

PERU—Tarapoto: *Spruce 4441* (K); San Govan: *Lechler 2306* (K, Y).

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[6] The Index Kewensis cites a *Clidemia heterophylla* Steud., which is merely a typographical error, the original name being *C. heteropila*.

[7] This is probably the same collection cited by Triana and Cogniaux as *Poeppig 2051* from Tocache, prov. Maynas. The Berlin sheet is sterile.

Studies of South American plants. I.
New or noteworthy plants from Peru and Amazonian Brazil

ALBERT C. SMITH

Recent collections from the Amazon valley have disclosed many interesting flowering plants of which some of those in the families *Moraceae, Loranthaceae, Olacaceae, Menispermaceae, Myristicaceae* and *Lauraceae* are considered in this paper. The collections were made by Mr. E. P. Killip and the writer in 1929 and by Mr. G. Klug in 1929 and 1930. All collections here cited are deposited in the herbarium of the New York Botanical Garden, and in each case there is a duplicate in the herbarium of the U. S. National Museum. The Killip & Smith collections are indicated in citations by '*KS*'. Most of the plants here considered were collected in the Department of Loreto in Peru, especially near the town of Iquitos, on the upper Amazon, and at Mishuyacu, near Iquitos. The elevation of both of these places is approximately 100 meters.

MORACEAE

TRYMATOCOCCUS AMAZONICA Poepp. & Endl. PERU—Loreto: Yurimaguas, on Río Huallaga, *KS 29052, 29114;* Iquitos, *KS 26997*. Yurimaguas is near the type locality, but the species is to be looked for from the lower Amazon as well.

POUROUMA CECROPIAEFOLIA Mart. PERU—Loreto: vicinity of Iquitos and along lower Río Huallaga, *KS 27381, 27932, 29839*. Previously known from the lower Amazon.

COUSSAPOA VILLOSA Poepp. & Endl. PERU—Loreto: lower Río Huallaga, *KS 28800*. Apparently rare; this collection is from near the type locality.

NAUCLEOPSIS MACROPHYLLA Miq. PERU—Loreto: Yurimaguas and vicinity, *KS 28179, 28244*. Our plant is probably identical with *N. Ulei* (Warb.) Ducke, the specific status of which is doubtful. It is probably fairly common in the region under consideration.

Dorstenia umbricola sp. nov. Herba semi-prostrata; caule basi decumbente simplice carnoso terete breviter pubescente; petiolis pubescentibus subteretibus; laminis oblongo-lanceolatis vel obovato-lanceolatis pergamentaceis, basi cuneatis vel truncatis, apice acutis, margine integris vel undulato-crenatis, supra glabris, subtus ad nervos parce pilosis, nervis lateralibus arcuato-adscendentibus cum nervo medio supra planis subtus elevatis; stipulis parvis lanceolato-ovatis deciduis; pedunculis axillaribus basi gracillimis, parce decidue breviter pilosis; receptaculo orbiculare concavo margine leviter tuberculato; floribus ♂ in ordines angustos dispositis, perianthio membranaceo glabro vel minute puberulo irregulare, staminibus 2, filamentis gracilibus

glabris, antheris globoso-didymis; floribus ♀ receptaculi locum medium occupantibus, ovariis 2–9 ovoideis, semi-immersis in alveolis delicatis, basi gracile affixis, stylo gracile apice bifido.

Semi-prostrate herb up to 2 decimeters high; stem decumbent at base, carnose, terete, pubescent with short spreading hairs up to 0.2 mm. long; petioles similarly pubescent, subterete, 5–13 mm. long; leaf-blades oblong-lanceolate or obovate-lanceolate, 8–10 cm. long, 2.5–3.2 cm. broad, cuneate or truncate at base, acute at apex, plane and entire or undulate-crenate at margins, pergamentaceous, glabrous and minutely foveolate above, sparsely pilose on nerves beneath (hairs pale, spreading, 0.2 mm. long), pinnate-veined, secondary nerves 7 or 8 per side, arcuate-ascending, connected near margins, with the midnerve plane above, raised beneath, veinlets reticulate, plane or slightly raised beneath; stipules lanceolate-ovate, 1–2 mm. long, soon deciduous; peduncles axillary, about 2.2 cm. long at maturity, slenderest at base, sparsely and deciduously short pilose; receptacle orbicular, concave, about 1.5 cm. in diameter at maturity, irregular at margins and slightly tuberculate; ♂ flowers limited to a narrow marginal region (sometimes also on narrow bands lying transversely across the receptacle); perianth membranous glabrous or minutely puberulus, irregularly cleft; stamens 2, filaments slender, glabrous, 0.5–0.8 mm. long, anthers globose-didymous, about 0.4 mm. in diameter; ♀ flowers occupying center of the receptacle; ovaries semi-immersed in delicate alveolae, attached by the slender base, 2–9 in number, ovoid, about 3.5 mm. by 1.5 mm.; style slender, 1–2 mm. long, bifid at apex.

Type, *KS 29639*, collected Sept. 20, 1929, in dense forest at Soledad, on Río Itaya, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species related to *D. nervosa* Desv. and *D. argentata* Hook. f. From the former it differs by having the ♂ and ♀ flowers on different portions of the receptacle, the petioles and peduncles shorter, etc. From the latter it differs by its non-variegated leaves and its less carnose receptacles which are less markedly tuberculate at the margins.

LORANTHACEAE

PSITTACANTHUS CRASSIFOLIUS Mart. Peru—Loreto: Mishuyacu, *Klug 119*. A well-marked species, characterized by its ternately arranged flowers, its short filaments attached near the apex of the perianth, and the numerous villose hairs within the perianth distally. It should be noted that our specimen has leaves up to 18 cm. long, the perianth up to 9 cm. long, the stamens attached 10 mm. below the perianth apex, and the anthers 5–6 mm. long. On this plant are also observed one or two spurs on each perianth lobe (the spurs fleshy, 1.5–2 mm. from apex of lobe, triangular, about 0.5 mm. long, often reduced). The perianth has a tendency to split below the contracted throat, but the apical portion bearing the stamens is rarely distinctly lobed.

Psittacanthus calcaratus sp. nov. Frutex parasiticus; ramulis validis subrugosis glabris subteretibus vel trigonis; petiolis rugosis glabris apice alatis; laminis coriaceis glabris utrinque stomatiferis oblongis vel ovato-oblongis leviter falcatis, basi attenuatis, apice rotundatis vel obtusis, margine integris et leviter revolutis, nervo medio prominente, nervis lateralibus adscendentibus elevatis; floribus grandis in paribus pedunculatis in racemo subterminale dispositis; pedunculis bracteatis (bracteis triangulari-ovatis); cupula subpatelliforme; calyculo cylindrico apice patulo; perigonio cylindrico gracile glabro carnoso, ultra medium dilatato, fauce contracta, lobis patulis linearibus acutis ad margines interiores calcaratis (calcaribus deltoideis carnosis); staminibus 6 perianthii lobis oppositis, filamentis carnosis glabris vel superne minute setosis, apice angustatis, antheras aequantibus, antheris lineari-oblongis laevibus dorso pubescentibus; stylo filiforme perianthii tubo paullo longiore, stigmate subgloboso.

Parasitic shrub; branchlets stout, subrugose, glabrous, brownish, subterete or trigonous; petioles rugose, glabrous, about 1 cm. long, winged above; leaf-blades thick coriaceous, glabrous, stomatiferous on both surfaces (stomata crowded, about 0.1 mm. long, about 30 per sq. mm. of surface above, slightly denser beneath), oblong or ovate-oblong, slightly falcate, 11–15 cm. long, 4–6 cm. broad, attenuate at base, rounded or obtuse at apex, entire and slightly revolute at margins, pinnate-veined, midvein stout, prominent on both surfaces, rugose, secondary veins 5–7 to a side, ascending, raised on both surfaces, veinlets obscurely reticulate; flowers large, arranged in pedunculate pairs on a subterminal raceme; rachis stout, 2–3 cm. long; peduncles about 5 mm. long, bract triangular-ovate, 1–1.5 mm. long; pedicels about 3 mm. long; cupula subpatelliform, about 2 mm. long and 4–5 mm. in diameter at rim; calyculus cylindric, flaring at apex, 5–6 mm. long, 2–2.5 mm. in diameter; perianth cylindric, 9–9.5 cm. long, slender, swollen slightly above middle, contracted at throat, flaring to lobes, glabrous, carnose, bright red, 6-lobed, lobes linear, 1–1.5 cm. long, 1.5 mm. broad, acute, recurved at maturity, each interior margin spurred about 1 mm. from apex (spurs triangular, about 0.8 mm. long and 0.5 mm. broad at base, pale, fleshy, thicker towards apex of lobe, forming pockets for anthers when young); stamens 6, opposite perianth lobes; filaments attached 11–12 mm. below apex of perianth, carnose, glabrous or minutely setose distally, 5–6 mm. long, narrowed at apex and attached to the anther dorsally near its base; anthers linear-oblong, about 6 mm. long and 1.5 mm. in diameter, bright yellow, smooth-surfaced, pubescent dorsally with several lax brown hairs up to 5 mm. long; style filiform, about 0.6 mm. in diameter, slightly longer than perianth at maturity; stigma subglobose, about 1.6 mm. in diameter.

Type, *Klug 694*, collected Dec., 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is most nearly related to *P. clusiaefolius* (Willd.) Eichl., from which it differs in leaf shape and in the presence of paired spurs on the

perianth lobes. These spurs suggest *P. caudatus* Ule, a species which is very distinct in other respects.

PSITTACANTHUS PERONOPETALUS Eichl. Peru—Loreto: Mishuyacu, *Klug 1323*. From material from farther down the Amazon our specimen differs by its longer perianths (up to 6.5 cm. long) and its more noticeably mucronate anthers.

Psittacanthus peculiaris sp. nov. Frutex parasiticus; ramulis teretibus glabris fuscis vel cinereis; petiolis subrugosis glabris anguste alatis; laminis coriaceis glabris utrinque stomatiferis ovatis vel ovato-oblongis, basi attenuatis, apice acutis vel longe acuminatis, margine integris, nervo medio immerso, nervis lateralibus adscendentibus obscuris; floribus grandibus in cymis axillaribus dichotomis dispositis, glabris; bracteis late triangularibus; cupula oblique subpatelliforme; calyculo cylindrico apice patulo; perigonio carnoso 6-angulato tubuloso gracile apice ampliore, lobis linearibus ad apices cohaerentibus acutis, ad apices extus calcara carnosa oblonga horizontali gerentibus; staminibus 6 perianthii lobis oppositis, filamentis brevissimis ad perianthii apicem insertis et hoc loco villosis, antheris lineari-oblongis; stylo filiforme quam perianthii tubo longiore, stigmate ellipsoideo.

Parasitic shrub; branchlets terete, glabrous, brownish or cinereous; petioles subrugose, glabrous, 3–6 mm. long, narrowly winged; leaf-blades thick coriaceous, glabrous, dark green, stomatiferous on both surfaces (stomata minute, dense beneath, scattered above), ovate or ovate-oblong, attenuate or cuneate at base, acute or long-acuminate at apex, entire at margins, 9–16 cm. long, 3.5–7 cm. broad, pinnate-veined, midvein immersed, secondary veins obscure, usually 3 to a side, oriented in basal half of leaf, ascending, veinlets obscurely reticulate; flowers large, 4 to an inflorescence, in axillary dichotomous cymes, glabrous; first and second branches of inflorescence 2–4 mm. long, bracts broadly triangular, about 1 mm. long; pedicles about 3 mm. long; cupula obliquely subpatelliform, about 0.8 mm. long and 1.8 mm. in diameter at rim, irregular at the thin margin; calyculus cylindric, flaring at apex, about 3 mm. long and 1.3 mm. in diameter, irregular-margined; perianth 6-angled, tubular, about 5 cm. long, slender (about 1 mm. in diameter) near base, gradually increasing to 4 mm. in diameter above, carnose, bright red, 6-lobed, lobes linear, about 1.5 mm. across, adherent to apex (easily separable in dissection), acute, sharply incurved for the distal 1.5 mm., each bearing at this point on the exterior surface a fleshy oblong horizontal spur (spurs about 1.8 mm. long, 1.6 mm. broad, 0.5 mm. thick); stamens 6, opposite perianth lobes; filaments minute, about 1 mm. long, attached about 6 mm. below apex of perianth, at which point are several reddish-brown villose hairs about 3 mm. long, narrowed at apex and attached to the anther dorsally near its base; anthers linear-oblong, fitting into the pockets formed by the overarching perianth lobes, 4–4.5 mm. long, about 0.6 mm. in diameter; stigma ellipsoid, about 0.8 mm. in diameter.

Type, *KS 29967*, collected Sept. 27, 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. Other collections from the same locality are: *Klug 118*, *1206*. Another collection, also from Loreto, is *KS 29653*, from Peña Blanca, on Río Itaya. It is a species which apparently stands alone in the possession of horizontal perianth spurs, which are so noticeable as to obscure, at a first glance, the true lobe apices. The remarkably short filaments are also noteworthy, the anthers appearing sessile on a slight internal swelling of the perianth. Its nearest relationship may be with *P. brachynema* Eichl. and *P. corynocephalus* Eichl., both of which have the reduced filaments. The adherence of perianth lobes to one another or their freedom does not seem a fundamental character in this genus.

PSITTACANTHUS CUCULLARIS (Lam.) Blume. PERU—Loreto: Mishuyacu, *Klug 1317*. Apparently not rare throughout Amazonian America.

PHTHIRUSA MICRANTHA Eichl. BRAZIL—Amazonas: Manáos, *KS 30187*. From the type locality.

OLACACEAE

Liriosma gracilis sp. nov. Frutex gracilis; ramulis subteretibus subrugosis fuscis glabris vel minute puberulis; petiolis subglabris rugosis apice alatis; laminis ovatis vel oblongo-ovatis opacis subcoriaceis, basi cuneatis vel acutis, apice acutis vel acuminatis, margine integris glabris vel supra ad nervum medium minute puberulis, nervo medio elevato, nervis lateralibus patulis elevatis; inflorescentia axillare breve racemosa, rachide gracile flexuosa striata minute puberula; floribus pedicellatis, cupula obconica, ad marginem membranacea, glabra vel parce puberula, perianthii lobis 6 aequalibus binis lanceolatis glabris apice recurvatis; staminibus 9(3 fertilibus 6 sterilibus), fertilibus cum perianthii lobis alternatis, filamentis pilosis, antheris oblongis; sterilibus perianthii lobis oppositis membranaceis gracilibus apice furcatis; stylo filiforme glabro, stigmate subhemisphaerico leviter 3-partito, ovario hemisphaerico dense minuteque puberulo.

Slender shrub up to 2 meters high; branchlets subterete, subrugose, fuscous, glabrous or minutely puberulous; petioles essentially glabrous, rugose, 2–4 mm. long, winged above; leaf-blades ovate or oblong-ovate, 6–7 cm. long, about 3 cm. broad, cuneate or acute at base, acute or acuminate at apex, entire and slightly membranous at margins, glabrous on both sides or minutely puberulous above on midnerve, opaque, subcoriaceous, dull green, pinnate-veined, midvein slightly raised on both surfaces, secondary veins 5–8 to a side, spreading, slightly elevated on both surfaces, veinlets obscurely reticulate; inflorescence axillary, short-racemose, 3–6-flowered; rachis slender, flexuose, striate, 4–6 mm. long, minutely puberulous (hairs pale, not exceeding 0.05 mm. in length); pedicels subrugose, puberulous like the rachis, about 2 mm. long, minutely bracteolate at base; cup obconical, glabrous or faintly puberulous,

1 mm. long and 1 mm. in diameter at summit, membranous margined; perianth lobes 6, equal, adherent in pairs, lanceolate, 6–7 mm. long, about 1 mm. broad, narrowed and recurved distally, coherent for the proximal one-third, thin-carnose or submembranous, glabrous; stamens 9(3 fertile, 6 sterile), the fertile ones alternate with the perianth lobes, placed between the adherent lobes, with white-pilose filaments about 1.2 mm. long and oblong anthers 1 mm. long, the sterile ones opposite the perianth lobes, membranous, slender, about 4 mm. long, forked for the distal one-third, pilose proximally, glabrous distally; style filiform, glabrous, 6 mm. long; stigma subspherical, lightly 3-cleft, granular; ovary hemispherical, densely and minutely white-puberulous (hairs not exceeding 0.1 mm. in length); fruit ellipsoid, about 18 mm. long and 9 m. in diameter, usually 1 to an inflorescence.

Type, *Klug 44*, collected Oct.–Nov., 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. Other collections from the same locality are: *Klug 848, 851, 1557*. It is a species most closely allied to *L. acuta* Miers, from which it differs by having the leaves slightly larger and essentially glabrous, the perianth glabrous, and the flowers considerably smaller in all parts. Description of the fruit is from *Klug 1557*.

MENISPERMACEAE

ODONTOCARYA TAMOIDES (DC.) Miers. BRAZIL—Pará: Ilha do Mosqueiro, near Pará, *KS 30517*. Not rare in eastern South America. Our plant had pistillate flowers in good condition in November.

ODONTOCARYA DIPLOBOTRYA Diels. PERU—Ayacucho: Río Apurimac Valley, alt. 400 m., *KS 22855*. The flowers of our specimen, which are staminate, are slightly larger in all parts than those described, but the difference does not appear of specific consequence.

Somphoxylon Klugii sp. nov. Frutex scandens; ramulis teretibus fuscis striatis; petiolis glabris subrugosis basi subincrassatis; laminis subcoriaceis glabris (vel subtus ad nervos minute pulverulentis) oblongis vel ovato-oblongis, basi rotundatis, apice acuminatis vel caudato-acuminatis, margine integris, venis lateralibus arcuato-adscendentibus cum nervo medio supra elevatis subtus prominentibus; inflorescentia ♂ paniculata, minute puberula; floribus ♂ fasciculatis bracteolatis pedicellatis, sepalis 3 exterioribus ovato-deltoideis patulis basi connatis, 3 interoribus membranaceis ovatis concavis, petalis 6 carnosis leviter concavis oblongis; staminibus 3 connatis, synandrio cylindrico, antheris ovoideis subsessilibus, loculis rimis lateralibus verticalibus dehiscentibus; floribus ♀ fructibusque ignotis.

Woody vine; branchlets terete, fuscous, striate; petioles glabrous, subrugose, 12–16 mm. long, slightly swollen at base; leaf-blades subcoriaceous, glabrous (or minutely puberulous on principal nerves beneath), oblong or ovate-

oblong, 13–16 cm. long, 5–6 cm. broad, rounded at base, acuminate or caudate-acuminate at apex, entire and submembranous at margins, pinnate-veined, primary lateral veins 7 or 8 to a side, arcuate-ascending, sometimes forked, with the midvein raised above, very prominent beneath, veinlets copiously and closely reticulate, raised on both surfaces; inflorescence panicled, up to 30 cm. long and broad at maturity, branches minutely puberulous with copious brown hairs; rachis 10 cm. long or more, primary branches 12–15 cm. long, secondary branches slender, 2.5–4 cm. long; flowers copious, in fascicles of 2–4, each fascicle subtended by an oblong acute bractlet up to 1 mm. long; pedicels up to 1.3 mm. long at maturity, minutely puberulous; exterior sepals 3, ovate-triangular, spreading, connate at base, about 0.6 mm. long, interior sepals 3, membranous, ovate, concave, faintly several-nerved, about 1.8 mm. long, 1.4 mm. broad; petals 6, carnose, slightly concave, oblong, about 1.4 mm. long and 0.8 mm. broad; stamens 3, united, synandrium cylindric, about 1.5 mm. long and 0.5 mm. in diameter, anthers ovoid, about 0.4 mm. in diameter, subsessile, the locules opening by lateral vertical clefts; ♀ flowers and fruit unknown.

Type, *Klug 579*, collected Oct.–Nov., 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species allied to *S. Wullschlaegelii* Eichl., from which it differs by having the petioles much shorter, the leaves smaller and narrower in proportion, and the flowers smaller.

Synandropus gen. nov.

Flores ♂: sepala 6, exteriora 3 parva deltoidea, interiora 3 majora ovata membranacea; petala 3 tenuiter carnosa, inflexa ad margines laterales, oblonga; stamina 3 inferne connata, antherae subglobosae rimis verticalibus lateralibus dehiscentes; flores ♀ adhuc ignoti. Frutices scandentes; folia petiolata integra margine serrata, basi palmatinervia, superne penninervia; inflorescentiae ♂ e trunco ortae paniculatae amplae, rami horizontaliter patentes; flores ♂ fasciculatae.

Sepals 6, 3 exterior small, triangular, 3 interior larger, ovate, membranous; petals 3, thin-carnose, membranous towards margins, inflexed at lateral margins, oblong; stamens 3, filaments connate proximally, anthers subspherical, 2-locular, opening by lateral vertical clefts; ♀ inflorescence and fruit unknown. High-climbing woody vines; leaves membranous, petioled, serrate at margins, palmate-nerved at base, pinnate-nerved above; ♂ inflorescence growing from stem below leaves, panicled, ample, with horizontal spreading branches; flowers fascicled.

A distinct genus, represented as far as known by the following species only. It is allied to *Odontocarya* Miers and *Somphoxylon* Eichl. of the tribe *Tinosporeae*. From the former of these genera it differs by having the stamens 3 rather than 6; from both it differs by having the stamens less completely fused and by having 3 petals rather than 6. It is probable that each

petal represents a fusion of 2, but the fusion is quite complete. The stamens are opposite the petals, which form, by their inflexed edges, little pockets for the anthers.

Synandropus membranaceus sp. nov. Frutex scandens; ramulis gracilibus striatis glabris; petiolis subteretibus gracilibus decidue laxe pilosis; laminis membranaceis oblongis basi cordatis apice obtuse acuminatis apiculatisque margine serratis, supra glabris viridisque, subtus pallidis et glabris vel parce pilosis, e basi 5–9-nerviis, nervo medio prominente, nervis lateralibus patulis leviter elevatis; inflorescentia ♂ paniculata glabra bracteata bracteolataque; floribus ♂ fasciculatis bracteolatis graciliter pedicellatis, sepalis 3 exterioribus membranaceis deltoideis acutis patulis basi connatis, 3 interioribus membranaceis concavis ovatis, petalis 3 tenuiter carnosis oblongis ad marginem membranaceis, inflexis ad margines laterales; staminibus 3 petalis oppositis, filamentis molliter carnosis ad medium connatis apice liberis, antheris subglobosis bilocularibus rimis verticalibus lateralibus dehiscentibus; inflorescentia ♀ fructeque ignota.

High-climbing woody vine; branchlets slender, striate, with loose thin glabrous brownish bark; petioles subterete, slender, 1–5 cm. long, deciduously pilose with pale lax hairs up to 0.5 mm. long; leaf-blades oblong, 8–10 cm. long, 3–4.5 cm. broad, cordate at base, obtusely acuminate and apiculate at apex, serrate at margins (serrations 1 or 2 per centimeter on mature leaves, each terminating a somewhat salient veinlet), membranous, above glabrous and virid, beneath pallid and glabrous or sparsely pale-pilose (hairs up to 0.3 mm. long, sometimes about 10 per sq. mm. of surface on young leaves, deciduous), 5–9-nerved from the base, nerves spreading, midnerve prominent on both surfaces, principal lateral nerves usually 4 to a side, spreading, slightly elevated, veinlets copiously reticulate, plane; ♂ inflorescence arising from branchlets below leaves, panicled, glabrous in all parts, up to 25 cm. long and 12 cm. broad; primary rachis striate, slender, circumscribed at base by several minute deciduous bractlets, secondary branches up to 6 cm. long, each subtended by a membranous lanceolate bractlet 1.5–2 mm. long which sometimes also subtends a single flower or a small fascicle, tertiary branches similar, up up to 1 cm. long; flowers in fascicles of 2 or 3, each fascicle subtended by a membranous ovate acute bractlet about 1 mm. long; pedicels slender, up to 1.5 mm. long; exterior sepals 3, membranaceous, triangular-acute, connate at base, spreading, about 0.6 mm. long; interior sepals 3, membranous, concave, ovate, about 1.5 mm. long and 1.2 mm. broad; petals 3 (each presumably formed by the fusion of 2), thin-carnose, oblong, about 1 mm. long and broad, membranous towards margins, lateral margins inflexed; stamens 3, opposite the petals, somewhat fused; filaments delicately carnose, about 0.8 mm. long, fused half their length, free distally; anthers subspherical, about 0.4 mm. in diameter, 2-locular, opening by lateral vertical clefts; ♀ inflorescence and fruit unknown.

Type, *KS 30217*, collected in swampy jungle at Breves, Amazon estuary, state of Pará, Brazil, Oct. 23, 1929, and deposited in the herbarium of the New York Botanical Garden.

DISCIPHANIA LOBATA (Mart.) Eichl. Peru—Loreto: Mishuyacu, *Klug 423, 780*. Previously known from Amazonian Brazil.

ELISSARRHENA GRANDIFOLIA (Eichl.) Diels. PERU—Loreto: Balsapuerto (lower Río Huallaga basin), *KS 28665*; San Antonio, on Río Itaya, *KS 29337*. Previously known from Amazonian Brazil.

MYRISTICACEAE

IRYANTHERA LEPTOCLADA Mgf. PERU—Loreto: lower Río Huallaga, *KS 29272*. Another collection not far from the type locality (mouth of Río Morona).

VIROLA MOLLISSIMA (A. DC.) Warb. PERU—Loreto: Yurimaguas, lower Río Huallaga, *KS 29044*. Our specimen is in fruit and permits the following notes to be added to previous descriptions:

Fruiting inflorescence up to 7 cm. long, once- or twice-branched, densely and closely ferruginous tomentose (hairs 1–1.5 mm. long, with numerous lateral spur-like branches); fruit sessile, spherical, 1–1.5 cm. in diameter, covered with a tomentum like that of the rachis (hairs up to 2.5 mm. long).

Virola loretensis sp. nov. Arbor; ramulis subteretibus dense fulvo-tomentosis pilis ramosis; petiolis teretibus crassis tomentosis; laminis oblongis vel anguste obovato-oblongis, basi cordatis, apice acutissimis, supra mox glabris, subtus tomento obtectis, nervo medio supra plano subtus prominente, nervis lateralibus patulis rectis ante marginem confluentibus; inflorescentia ♂ axillare dense tomentosa paniculata multiflora; floribus fasciculatis bracteis fugacibus lanceolatis suffultis; floribus ♂ graciliter pedicellatis infundibuliformibus, perigonio trifido extus tomentoso intus glabro; antheris 3 linearibus connatis subacutis, quam columna paullo longioribus; inflorescentia ♀ quam masculina minus ramosa, floribus subsessilibus.

Tree 4–8 meters high; branchlets subterete, densely and apparently persistently tomentose (hairs 1.5–3.5 mm. long, multicellular, with numerous short horizontal spur-like branches, ferruginous); petioles similarly tomentose, terete, stout (2.5–4 mm. in diameter), 3–10 mm. long; leaf-blades oblong or narrowly obovate-oblong, 15–30 cm. long, 4–9 cm. broad, cordate (rarely rounded or truncate) at base, acute or gradually sharp-acuminate at apex, entire and slightly revolute at margins, brown, above glabrous and dull (tomentose on midnerve, sometimes on surface of very young leaves), beneath densely or sparsely tomentose with spreading branched hairs similar to those of the branchlets, most densely so on the nerves, pinnate-veined, midnerve nearly plane or slightly raised above, prominent beneath, secondary nerves 15–19 to a side, spreading at an angle of about 60 degrees, straight, parallel, arcuate and connected near margins, slightly impressed above, raised beneath,

tertiary nerves subparallel, nearly plane, veinlets copiously reticulate; ♂ inflorescence axillary, panicled, 3–5-times branched, many-flowered, up to 20 cm. long and 15 cm. broad, densely brown tomentose with hairs similar to those of the branchlets; bracts each subtending a group of 8–15 flowers, linear-lanceolate, about 3 mm. long, densely ferruginous tomentose dorsally and at margins (hairs similar to those of branchlets but frequently unbranched), glabrous within, soon deciduous; flowers in ultimate clusters of 4–13 in umbelliform panicles, pedicellate (pedicels slender, 0.25 mm. in diameter, 1–3 mm. long, ferruginous tomentose (hairs about 0.2 mm. long, branching, contracted to appear stellate), continuous with perianth); perianth infundibuliform, 1.5–2.5 mm. long, tomentose without (hairs similar to those of the pedicel, frequently 0.1 mm. long), glabrous within, 3 (rarely 4-)-fid about one-third its length, lobes ovate-deltoid, subacute; anthers 3(always?), connate, erect, linear, subacute at apex, about 0.6 mm. long, column glabrous, slightly shorter than the anthers (0.3–0.5 mm. long); ♀ inflorescence axillary, once- or twice-branched, up to 15 cm. long, many-flowered, tomentose as the ♂ inflorescence (hairs usually simple); flowers in ultimate clusters of 5–10, subsessile; perianth similar to that of ♂ flowers; ovary spherical, about 1.8 mm. in diameter, densely sericeo-tomentose (hairs usually simple, multicellular, up to 1 mm. long); stigma sessile.

Type, *KS 27359*, collected Aug. 9, 1929, in woods at Iquitos, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. Other collections, all from Loreto, are: Iquitos, *KS 27026*; Mishuyacu, *Klug 1502, 1543;* Peña Blanca, on Río Itaya, *KS 29671*. Description of the bracts is taken from *KS 27026*, of the ♀ inflorescence from *Klug 1502*. It is a very distinct species, probably most closely related to *V. officinalis* (Mart.) Warb. and *V. calophylla* Warb., from both of which it differs markedly in its long persistent hairs, and also in petiole, leaf, and flower dimensions.

VIROLA CALOPHYLLA Warb. PERU—Loreto: Mishuyacu, *KS 29933, Klug 188, 473, 533*. Possibly our specimens represent a variety of this Brazilian species; they have somewhat shorter petioles and pedicels.

COMPSONEURA CAPITELLATA (A. DC.) Warb. PERU—Loreto: Mishuyacu, *Klug 180*. The type of the species is from the Río Huallaga. Our plant has slightly larger stamens, but agrees in all important character with the description.

COMPSONEURA TESSMANNII Mgf. PERU—Junín: San Nicholas, Pichis Trail, alt. 1100 m., *KS 26053*. The description of this species, the type of which is from the upper Marañon, gives the leaf base as rotund, but the type collection and our specimen both show it to be acute or cuneate. In the present specimen the anthers are up to 1.5 mm. long, but in all essential features it agrees well with the above mentioned robust species.

Lauraceae

Cryptocarya robusta sp. nov. Arbor ca. 9 metralis; ramulis subteretibus, cortice glabro vel sericeo obtectis; petiolis supra planis subrugosis subglabris; laminis oblongis vel ellipticis subcoriaceis olivaceis basi cuneatis apice obtuse acuminatis, supra glabris, subtus minutissime sericeis vel glabris, nervo medio supra prominulo subtus prominente, nervis lateralibus rectis adscendentibus; inflorescentia paniculata pauciflora sericea; bacca parva globosa vel obovoidea, reliquis perianthii staminumque coronata; perianthii lobis trigonis; filamentis brevissimis glabris, antheris subtrigonis; ovario perianthii tubo immerso ellipsoideo glabro.

Tree 6–9 meters high; branchlets subterete, glabrous or minutely sericeous when young; petioles flattened above, 10–12 mm. long, about 2 mm. in diameter, subrugose, essentially glabrous; leaf-blades oblong or elliptic, 17–22 cm. long, 6–9 cm. broad, cuneate at base, obtusely acuminate at apex, entire at margins, subcoriaceous, olivaceous, glabrous above, glabrous or minutely sericeous beneath (hairs pale, closely appressed and dense when present, about 0.1 mm. long), pinnate-veined, midnerve slightly raised above, prominent beneath, secondary nerves 4 or 5 per side, straight, ascending, arcuate near margins, nearly plane above, raised beneath, veinlets reticulate, slightly raised beneath; inflorescence panicled, about 7 cm. long in our specimen, once-branched, branches of inflorescence faintly striate, subterete, minutely and densely pale sericeous; young fruits 15–25 to an inflorescence, pedicellate (pedicels 3–7 mm. long, terete, minutely sericeous), subspherical or obovoid, 4–6 mm. in diameter, composed of a thick enlarged perianth tube, surmounted by remnants of perianth lobes and stamens; perianth lobes 6, slightly imbricate, triangular, acute, about 0.7 mm. in length and breadth; first and second series of stamens 3 each, anthers subtriangular, about 0.35 mm. in length and breadth, opening introrsely, filaments stout, short (0.1 mm. long), apparently glabrous and free from the perianth lobes; third and fourth series of stamens not observed; ovary carnose, ellipsoid, about 3 mm. long in our specimen, completely enclosed in the perianth tube, attached only at base; stigma not observed.

Type, *KS 26077*, collected July 4, 1929, in dense forest at San Nicholas, Pichis Trail, dept. Junín, Peru, alt. 1100 m., and deposited in the herbarium of the New York Botanical Garden. It is a very distinct plant, with larger leaves than any other species of the genus. Its nearest ally appears to be *C. pachycarpa* Gleason, with which it has in common an unusually thickened perianth tube.

Aniba compacta sp. nov. Arbor ca. 18 metralis; ramis ramulisque leviter striatis cinereis glabris vel minute pulverulentis bene foliatis; petiolis supra leviter canaliculatis subrugosis, decidue pulverulentis; laminis obovatis vel oblongo-obovatis coriaceis fuscis, basi cuneato-attenuatis, apice obtuse breviter acuminatis, glabris vel parce pulverulentis ad basin, nervo medio promi-

nente, nervis lateralibus patulis, arcuatis ad marginem; inflorescentia paniculata multiflora, dense cinereo-tomentella; floribus hermaphroditis dense tomentellis graciliter pedicellatis, perianthii tubo prismatico, lobis ovatis subacutis, intus ad apicem glabris; androecei seriebus 2 exterioribus fertilibus, filamentis robustis antheras subaequantibus, antheris subtrigonis obtusis breviter pilosis; staminodiis ser. III. magnis oblongis breviter pilosis, basi glandulis binis magnis suffultis; ovario perianthii tubo immerso, ellipsoideo glabro, stylo gracile, stigmate truncato.

Tree up to 18 meters high; branches and branchlets lightly striate, cinereous, glabrous or minutely pulverulent when young; petioles shallowly canaliculate above, subrugose, deciduously pulverulent, 12–18 mm. long; leaf-blades obovate or oblong-obovate, 10–15 cm. long, 3.5–6.5 cm. broad, cuneate-attenuate at base, obtuse or bluntly short-acuminate at apex, entire and plane at margins, coriaceous, fuscescent, glabrous or faintly pulverulent towards base on both surfaces, pinnate-veined, midvein stout, raised on both surfaces, secondary veins 8–12 to a side, spreading, arcuate and obscurely connected near margins, slightly raised above, plane or slightly impressed beneath, veinlets closely reticulate, impressed on both surfaces; inflorescence panicled, once- or twice-branched, up to 13 cm. long, many-flowered, branches of inflorescence striate, densely cinereous-tomentellous (hairs about 0.1 mm. long), secondary branches up to 2 cm. long; flowers solitary or in clusters of 2 or 3, bracteolate at base (bractlets oblong, densely tomentellous, 1–2 mm. long, soon deciduous), pedicellate (pedicels 3–6 mm. long when mature, tomentellous), 3–3.5 mm. long, densely tomentellous; perianth tube short subcylindric or prismatic, about 1.8 mm. long and 2 mm. in diameter, lobes 6, subequal, erect, narrowly imbricate, broadly ovate, subacute or rounded, about 1.3 mm. long and 1.5 mm. broad, glabrous within distally, pilose at base; stamens 9; first and second series: fertile, filaments stout, about 0.5 mm. long and 0.8 mm. broad, densely short-pilose, anthers deltoid, about 0.5 mm. long, obtuse at apex, short-pilose, bilocular, opening introrsely; third series: sterile, oblong, about 1.3 mm. long and 0.4 mm. broad, blunt at apex, densely short-pilose, biglandular at base (glands subspherical, sessile, about 0.5 mm. in diameter); ovary ellipsoid, glabrous, completely immersed in perianth tube, about 1 mm. long and 0.5 mm. broad at anthesis; style slender, 1.5 mm. long, stigma truncate.

Type, *Klug 608*, collected Oct.–Nov., 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a very distinct species, related to *A. Canelilla* (HBK.) Mez, with which it has in common a sterile third series of stamens, but from which it differs by its long many-flowered inflorescence, its large flowers with equal perianth segments, its pilose filaments, etc. It may also bear a relationship to *A. citrifolia* (Nees) Mez, from which it differs by having its veinlets immersed, its perianth tube longer than the lobes, its filaments shorter, its third series of stamens sterile, and its style longer.

ANIBA PANURENSIS (Meissn.) Mez. PERU—Loreto: Mishuyacu, *Klug 409*. Previously known from Brazil; our plant is exactly similar to *Spruce 2603* from the Río Uaupes.

Aniba reticulata sp. nov. Arbor; ramis ramulisque leviter striatis cinereis vel fuscis, parce pilosulis vel glabris; petiolis subteretibus rugosis nigrescentibus glabris; laminis oblongo-ovatis chartaceis olivaceis, basi longe cuneatis, apice breviter acuminatis, glabris vel parce pilosis, nervo medio utrinque elevato, nervis lateralibus adscendentibus; inflorescentia paniculata multiflora, parce pilosa; floribus hermaphroditis graciliter pedicellatis extus pilosis, perianthii tubo obconico, lobis ovatis reflexis, intus dense breviter velutinis, androecei seriebus 3 fertilibus, filamentis brevissimis, seriei tertiae basi glandulis binis sessilibus suffultis, antheris ovoideis, apice obtusis vel leviter emarginatis; ovario subgloboso glabro, stigmate subsessile.

Tree; branches and branchlets lightly striate, cinereous or brownish, minutely and sparsely pilosulous when young, soon glabrous; petioles subterete, rugose, 6–10 mm. long, narrowly winged above, nigrescent, essentially glabrous; leaf-blades oblong-ovate, 8–13 cm. long, 3.5–4.5 cm. broad, long-cuneate at base, bluntly short-acuminate at apex, entire at margins, chartaceous, olivaceous, glabrous on both surfaces or minutely and sparsely pilose (hairs pale brown, spreading, about 0.2 mm. long, especially on the nerves), pinnate-veined, secondary nerves 5 or 6 to a side, ascending, with the midnerve raised on both surfaces, veinlets copiously reticulate, elevated on both surfaces; inflorescence panicled, 2- or 3-times branched, up to 9 cm. long, about 100-flowered, branches of inflorescence nigrescent, lightly striate, sparsely pilose (hairs pale, about 0.1 mm. long), secondary branches less than 1 cm. long; flowers solitary or in fascicles of 2 or 3, bracteolate at base (bractlets oblong, about 1 mm. long, pilose), pedicellate (pedicels up to 5 mm. long, pilose), about 3 mm. long and 4 mm. in diameter when expanded, pilose without; perianth tube obconical, about 2 mm. long, lobes 6, subequal, reflexed at maturity, broadly ovate, 2–2.5 mm. long and broad, densely short-velutinous within (hairs pale brown, minute, forming a thin close tomentum); stamens 9, all fertile with 2-locular anthers; first and second series: filaments minute, contracted, glabrous, about 0.1 mm. long, anthers broadly ovoid, about 0.4 mm. long and 0.7 mm. broad, obtuse or lightly emarginate at apex, opening introrsely; third series: filaments contracted, short, obscured by 2 large flat semi-confluent glands, anthers as those of the outer series, opening extrorsely; ovary subglobose, about 1.5 mm. in diameter, glabrous, stigma subsessile, irregularly peltate, about 1 mm. in diameter.

Type, *KS 28050*, collected Aug. 25, 1929, in woods at Yurimaguas, on lower Río Huallaga, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species related to *A. Muelleriana* Mez, from which it differs by its larger flowers, its contracted and glabrous filaments, and its short style.

ANIBA CITRIFOLIA (Nees) Mez. PERU—Loreto: Mishuyacu, *Klug 1313*. Our plant has shorter pedicels and larger leaves than typical material from Brazil.

ACRODICLIDIUM ARMENIACUM (Nees) Mez. PERU—Loreto: Mishuyacu, *Klug 1267, 1379*. Apparently a rare species, previously collected by Poeppig. It is well-marked by its ovate-lanceolate leaves, its slender flexuose pedicels, and its introrse-apically dehiscing anthers.

Acrodiclidium latifolium sp. nov. Arbor ca. 4 metralis; ramulis subteretibus rectis dense ferrugineo-sericeis; petiolis subrugosis supra canaliculatis gracilibus pilosis; laminis oblongis vel late ovato-oblongis subcoriaceis olivaceis, basi late cuneatis, apice caudato-acuminatis, supra glabris vel parce pilosis, subtus ferrugineo-pilosis, nervo medio prominente, nervis lateralibus arcuato-adscendentibus supra subplanis subtus prominentibus; inflorescentia paniculata multiflora, dense sericea modo ramulorum; floribus hermaphroditis graciliter pedicellatis sericeis, perianthii tubo obconico vel breviter cylindrico, lobis oblongis subacutis intus glabris; staminibus serierum 2 exteriorum sterilibus ovato-oblongis, seriei tertiae fertilibus, filamentis quam antheris 2–3-plo longioribus, basi biglandulosis, antheris bilocularibus extrorsis; ovario ellipsoideo-ovoideo glabro subrugoso immerso, stylum aequante.

Tree about 4 meters high; branchlets subterete, straight, densely and closely ferruginous sericeous (hairs appressed, about 0.1 mm. long, completely covering young branchlets, deciduous); petioles subrugose, canaliculate above, 12–15 mm. long, slender (less than 2 mm. in diameter), appressed pilose (hairs often longer than those of the branchlets); leaf-blades oblong or broadly ovate-oblong, 15–19 cm. long, 7–9 cm. broad, broadly cuneate at base, caudate-acuminate at apex, plane and entire at margins, subcoriaceous, olivaceous, glabrous above or pilose on and near the principal veins (hairs appressed, about 0.3 mm. long), regularly pale-ferruginous-pilose beneath (hairs subappressed, 0.3–0.4 mm. long, densest on the nerves, 15–30 per sq. mm. of surface), pinnate-veined, midnerve raised above, prominent beneath, secondary nerves 5–7 per side, arcuate-ascending, nearly plane above, prominent beneath, veinlets reticulate, subimmersed; inflorescence panicled, 7–9 cm. long, solitary in leaf axils, twice-branched, about 100-flowered, branches of inflorescence terete, densely sericeous as the branchlets; flowers in fascicles of 2 or 3, minutely bracteolate at base, pedicellate (pedicels sericeous, slender, 1–4 mm. long), 1.5–2 mm. long; perianth tube obconical or short-cylindric, 1.3–1.5 mm. long, about 1.5 mm. in diameter, lobes 6, incurved, equal, closely sericeous without (hairs 0.1 mm. long), glabrous within, oblong, subacute, 0.6–0.8 mm. long, 0.7 mm. broad; stamens 9; first and second series: sterile, ovate-oblong, rounded at apex, 0.5 mm. long and broad, slightly concave, sparsely short-pilose without; third series: fertile, oblong, 0.6 mm. long, 0.5 mm. broad, filaments 2 or 3 times as long as the anthers, sparsely pilose at base, biglandular at base (glands nigrescent, globose, sessile, about 0.15 mm. in

diameter), anthers bilocular, locules opening extrorse-apically; ovary elliptic-ovoid, about 0.5 mm. long at anthesis, glabrous, subrugose, immersed, style about as long or slightly shorter, stigma truncate.

Type, *Klug 30*, collected Oct.–Nov., 1929, in clearing in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species closely allied to *A. brasiliense* Nees and *A. aureum* Huber, from both of which it differs by having its leaves larger and oblong rather than ovate-lanceolate and its inflorescence longer. Our plant has flowers slightly larger than those of *A. brasiliense* and the ovary strictly glabrous rather than sparsely short-pilose (as it is in *A. brasiliense* regardless of the description).

Acrodiclidium macrophyllum sp. nov. Arbor ca. 4 metralis; ramulis subteretibus cinereis glabris; petiolis valde canaliculatis crassis glabris; laminis oblongo-ovatis coriaceis, olivaceis vel fuscis, basi cuneatis, apice acuminatis(?), supra glabris subtus minute pilosis, nervo medio prominente, nervis lateralibus patulis arcuatis ad marginem; inflorescentia racemoso-paniculata, 20–40-floris, pilosa; floribus hermaphroditis pedicellatis glabris, perianthii tubo obconico subrugoso carnoso, lobis erectis ovatis; staminibus serierum 2 exteriorum sterilibus spathulatis vel obovatis glabris, seriei tertiae fertilibus, filamentis antheras aequantibus dense pilosis basi biglandulosis, antheris carnosis subglobosis extrorsis; ovario ellipsoideo-ovoideo glabro semi-immerso stylum aequante.

Tree 4 meters high; branchlets subterete, cinereous, glabrous; petioles deeply canaliculate, 20–30 mm. long, stout (2–4 mm. in diameter), essentially glabrous; leaf-blades oblong-ovate, 25–33 cm. long, 11–13 cm. broad, cuneate at base, acuminate at apex (?, incomplete in our specimen), entire and narrowly cartilaginous at margins, coriaceous, olivaceous above, brownish beneath, glabrous above, sparsely and minutely pilose beneath (hairs spreading, pale, translucent, about 0.1 mm. long, soon deciduous), pinnate-veined, midnerve prominent on both surfaces, secondary nerves about 8 per side, spreading, ascending near margins, raised on both surfaces, veinlets reticulate, slightly elevated beneath, the finer ones obscure; inflorescence racemose-panicled, once-branched, up to 6 cm. long on our specimen (conceivably much longer), 20–40-flowered, branches of inflorescence subterete, pilose with pale spreading hairs up to 0.3 mm. long; flowers solitary or in fascicles of 2 or 3, bracteate at base (bracts oblong, sparsely pilose, about 1 mm. long), pedicellate (pedicels essentially glabrous, 1.5–2.5 mm. long), glabrous, about 3 mm. long; perianth tube obconical, 1–1.5 mm. long, subrugose, carnose, lobes 6, subequal, erect, slightly concave, ovate, about 1.4 mm. long and 1. 2 mm. broad; stamens 9; first and second series: sterile, spatulate or obovate, glabrous, about 0.9 mm. long and 0.7 mm. broad; third series: fertile, filaments stout, about 0.6 mm. long, densely pilose (hairs brown, straight, ascending, about 0.2 mm. long), biglandular at base (glands subglobose, about 0.3 mm.

in diameter, minutely stipitate with short-pilose stalks), anthers carnose, subglobose, about 0.7 mm. in diameter, opening extrorse-apically; ovary elliptic-ovoid, about 0.8 mm. in diameter, glabrous, semi-immersed, style about as long as ovary, stigma truncate.

Type, *Klug 80*, collected Oct.–Nov., 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a very distinctive species, most closely allied to *A. brasiliense* Nees and *A. latifolium* (above described). Both of these species, however, have much smaller leaves and densely strigose flowers, as well as differences in staminal measurements, etc. In leaf size and shape, our species is suggestive of *A. Canelo* Rose, an unpublished Ecuadorean species which is not to be confused with *A. Canella* (Meissn.) Mez. *A. Canelo*, known in fruit only, has veinlets much more prominent than our plant and leaves somewhat narrower.

Endlicheria mishuyacensis sp. nov. Arbor ca. 10 metralis; ramis ramulisque gracilibus striatis cinereis decidue strigosis; petiolis canaliculatis rugosis gracilibus strigosis vel subglabris; laminis oblongo-lanceolatis vel anguste obovatis chartaceis, basi attenuatis, apice obtuse acuminatis, glabris vel parce strigosis, nervo medio prominente, nervis lateralibus arcuatis adscendentibus ad marginem; inflorescentia ♂ paniculata subflexuosa pauciflora, minute strigosa; floribus ♂ minute pallido-strigosis breviter pedicellatis, perianthii tubo obconico, lobis oblongo-ovatis intus glabris; androecei seriebus 3 omnibus fertilibus, filamentis carnosis dilatatis, basi eglandulosis, antheris filamenta aequantibus apice subacutis; inflorescentia ♀ adhuc ignota; bacca ovoidea vel obovoidea, cupula subsessile.

Tree 6–10 meters high; branches and branchlets cinereous, slender, striate, when young minutely strigose (hairs appressed, brown, up to 0.2 mm. long), becoming glabrous; petioles canaliculate above, rugose, 3–10 mm. long, slender (1–1.5 mm. in diameter), winged distally, strigose as the branchlets or subglabrous; leaf-blades oblong-lanceolate or narrowly obovate, 7–16 cm. long, 2–5.5 cm. broad, attenuate at base, obtusely acuminate at apex, entire and slightly thickened at margins, chartaceous, dark green, somewhat lustrous, glabrous or sparsely strigose on both surfaces (hairs appressed, scattered, about 0.2 mm. long, densest near the midnerve, soon deciduous), venation pinnate, midnerve prominent on both surfaces, secondary nerves 4–6 per side, arcuate, ascending near margins, raised on both surfaces, veinlets copiously and prominently reticulate; ♂ inflorescence panicled, subflexuose, 3–4 cm. long, about 10–20-flowered, rachis and secondary branches slender, violaceous, striate, minutely strigose as the branchlets; flowers minutely pale-strigose without with appressed hairs about 0.1 mm. long, short-pedicellate (pedicels up to 1.5 mm. long); perianth tube obconical, 1–1.3 mm. long, limb spreading, 6-lobed, lobes thin carnose, oblong-ovate, 1–1.3 mm. long, 0.8 mm. broad, glabrous within; stamens 9, all fertile with short carnose dilated filaments and

2-locular anthers, eglandular at base; first and second series: 0.7–0.9 mm. long, connective extended slightly beyond anthers and marked introrsely with a few scattered minute yellowish glands, anthers about as long as filaments, stout, opening introrse-laterally; third series: similar, connective eglandular, anthers opening extrorse-laterally; fourth series and gynecium completely lacking; ♀ inflorescence not seen; calyx in fruit subsessile, dull red, about 13 mm. in diameter at summit; fruit ovoid or obovoid, dark green, up to 30 mm. long and 18 mm. in diameter at middle, imbedded in the cup about one-fourth its length.

Type, *Klug 204*, collected Oct.–Nov., 1929, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. Other collections from the same locality are: *Klug 411, 621, 703, KS 29870* (from which the fruit is described). A plant from Balsapuerto, lower Río Huallaga basin, *KS 28400*, is also referable here. It is a species allied to *E. dysodantha* (R. & P.) Mez, from which it differs by having its pedicels shorter, its flowers about twice as large, and its third series of filaments eglandular. Its relationship to recently described species of lowland Peru is not close.

ENDLICHERIA ARUNCIFLORA (Meissn.) Mez. Peru—Loreto: Mishuyacu, *Klug 1264, 1403*. Our specimen has leaves up to 25 cm. long and 8.5 cm. broad. It is apparently a rare species, but no important differences are apparent between the present specimens and the description and plate (typical material is not available to me).

ENDLICHERIA ANOMALA Nees. PERU—Loreto: Iquitos, *KS 27192;* Mishuyacu, *KS 29959, Klug 728*. Local name: 'Canela.' Evidently a widely distributed species from Guiana to Amazonian Peru. It was collected on the Río Ucayali by Tessmann.

PERSEA BOLIVIENSIS Mez & Rusby. PERU—Junín: San Ramon, alt. 1400–1700 m., *KS 24831*. Previously known from Bolivia.

Phoebe pichisensis sp. nov. Arbor ca. 10 metralis; ramis ramulisque subteretibus leviter striatis fuscis vel stramineis decidue pulverulentis; petiolis leviter canaliculatis gracilibus puberulis; laminis ovato-oblongis chartaceis, basi cuneatis, apice obtuse breviter acuminatis, supra subglabris, subtus pilosis, nervo medio supra plano subtus elevato, nervis lateralibus arcuato-adscendentibus; inflorescentia paniculata multiflora minute puberula; floribus hermaphroditis extus parce puberulis breviter pedicellatis, perianthii tubo late obconico, lobis ovato-oblongis; androecei seriebus 3 fertilibus, filamentis antheras aequantibus gracilibus, serierum I et II glabris, seriei III introrse pilosis basi biglandulosis; antheris oblongis obtusis; staminodiis ser. IV. sagittato-triangularibus glabris filamenta aequantibus; ovario glabro globoso stylum aequante; bacca carnosa globosa, basi perianthii lobis persistentibus circumdata.

Tree 5–10 meters high; branches and branchlets subterete, lightly striate, fuscous or stramineous, when young pulverulent with minute pale hairs, becoming glabrous; petioles shallowly canaliculate, 6–10 mm. long, slender, narrowly winged distally, puberulous (hairs minute, pale, less than 0.2 mm. long); leaf-blades ovate-oblong, 8–12 cm. long, 2.5–4 cm. broad, cuneate at base, bluntly short-acuminate at apex, entire and slightly thickened at margins, chartaceous, yellowish green, essentially glabrous above, pilose beneath (hairs pale, spreading, about 0.1 mm. long, slightly longer in nerve axils, persistent on our specimen), venation pinnate, secondary nerves 3 or 4 per side, arcuate-ascending, with the midnerve plane above, raised beneath, pale, conspicuous, veinlets reticulate, plane above, prominulous beneath; inflorescence panicled, axillary, 5–12 cm. long, 2- or 3-times branched, many-flowered (probably 25–100-flowered); rachis and branches stramineous, minutely puberulous, primary branches 1–4 cm. long; flowers greenish yellow, sparsely pale puberulous without, short-pedicellate (pedicels 2–3 mm. long); perianth tube broadly obconical, 1–1.5 mm. long, lobes 6, equal, slightly imbricate, ovate-oblong, about 2.1 mm. long and 1.5 mm. broad; fertile stamens 9, in three series, all with 4-locular anthers, first and second series with slender glabrous filaments about 0.9 mm. long and oblong anthers 0.9 mm. long and 0.5 mm. broad, anthers obtuse at apex, opening introrsely, third series with slender introrsely pilose (hairs reddish brown, about 0.15 mm. long) biglandular (glands cordate, orbicular, sessile, 0.5 mm. in diameter, attached slightly above base) filaments about 1.2 mm. long and oblong extrorsely dehiscent anthers 0.9 mm. long and 0.4 mm. broad; staminodes of fourth series sagittate-triangular, glabrous, 0.5 mm. long, 0.6 mm. broad, with filaments about the same length; ovary glabrous, globose, about 1.4 mm. in diameter at anthesis, style about 1 mm. long, stigma truncate; fruit carnose, globose, up to 4 mm. in diameter, surrounded at base by persistent perianth lobes.

Type, *KS 25430*, collected June 28, 1929, in dense forest, Kilometer 3–10, on Pichis Trail, dept. Junín, Peru, alt. 900 m., and deposited in the herbarium of the New York Botanical Garden. It is a species very closely related to *P. Brasiliensis* Mez, from which it differs by its somewhat narrower leaves with conspicuously pale nerves. In floral characters the two species are almost identical; however, the present species has staminodes about half as large as those of *P. Brasiliensis* and rather less conspicuous glands on the filaments of the third staminal series.

OCOTEA ACIPHYLLA (Nees) Mez. Peru—Loreto: Mishuyacu, *Klug 891*. Previously known from Amazonian Brazil.

Ocotea Keriana sp. nov. Arbor ca. 9 metralis; ramulis teretibus olivaceis vel nigrescentibus parce decidue tomentellis; petiolis leviter canaliculatis gracilibus nigrescentibus subrugosis glabris; laminis oblongo-ovatis vel oblongo-lanceolatis chartaceis olivaceis glabris, basi cuneato-attenuatis, apice

obtuse longe-acuminatis, nervo medio elevato, nervis lateralibus arcuato-adscendentibus; inflorescentia paniculata multiflora gracile minute tomentella; floribus hermaphroditis graciliter pedicellatis extus strigosis intus minute tomentellis, perianthii tubo obconico rugoso, lobis oblongo-ovatis subacutis, 3 exterioribus angustioribus; androecei seriebus 3 fertilibus, filamentis brevibus, seriei III basi biglandulosis; antheris oblongis apice truncatis; ovario subgloboso glabro stylum aequante.

Tree 6–9 meters high; branchlets terete, olivaceous or nigrescent, sparsely and minutely tomentellous when young, soon glabrous; petioles shallowly canaliculate, 6–11 mm. long, slender, nigrescent, subrugose, glabrous; leaf-blades oblong-ovate or ovate-lanceolate, 11–17 cm. long, 3.5–5.5 cm. broad, cuneate-attenuate at base, obtusely long-acuminate at apex, entire at margins, chartaceous, olivaceous, glabrous on both surfaces or minutely tomentellous on nerves beneath, pinnate-veined, secondary nerves 5 or 6 per side, arcuate-ascending, with the midnerve raised on both surfaces, veinlets prominulous-reticulate; inflorescence panicled, 8–14 cm. long, 4–8 cm. broad, 2- or 3-times branched, 100–200-flowered, branches of inflorescence slender, terete, minutely tomentellous (especially on young parts) with pale appressed hairs about 0.1 mm. long, lateral branches horizontal, up to 4 cm. long; flowers hermaphrodite, pale yellow, solitary or in clusters of 2 or 3, pedicellate (pedicels slender, 1–3 mm. long, minutely strigose with pale hairs about 0.1 mm. long, minutely deciduously bracteolate at base), short-strigose without, minutely tomentellous within, 2.5–3 mm. long at maturity; perianth tube obconical, rugose, about 1 mm. long, lobes 6, slightly imbricate, oblong-ovate, subacute, about 1.8 mm. long, the 3 exterior 1 mm. broad, the 3 interior 1.5 mm. broad; stamens 9, all fertile with 4-locular anthers; first and second series: filaments glabrous, 0.25 mm. long, eglandular, anthers 0.9 mm. by 0.5 mm., truncate at apex, locules introrse; third series: filaments glabrous, 0.3 mm. long, biglandular at base (glands subnigrescent, subglobose, 0.3 mm. in diameter, subsessile or with minute stalks 0.1 mm. long), anthers oblong, 0.8 mm. by 0.5 mm., locules extrorse; ovary subglobose, about 0.8 mm. in diameter at anthesis, glabrous; style as long as or slightly longer than ovary, stigma subcapitate.

Type, *KS 27111*, collected Aug. 5, 1929, in woods at Iquitos, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species related to *O. fasciculata* (Nees) Mez, from which it differs by its larger leaves and longer inflorescence, smaller floral glands, and lack of staminodes. From *O. minutiflora* O. C. Schmidt, another ally, it differs in leaf shape and size and in its larger flowers and long style. The species is dedicated to Mr. Graham Ker of Iquitos, whose hospitality and advice were much appreciated by the collectors.

Ocotea olivacea sp. nov. Arbor ca. 15 metralis; ramulis sulcato-angulatis fuscis glabris; petiolis canaliculatis crassis glabris; laminis oblongis vel oblongo-ellipticis, chartaceis vel subcoriaceis, olivaceis, utrinque glabris, basi

abrupte cuneatis, apice longe acuminatis, nervo medio supra elevato subtus prominente, nervis lateralibus arcuato-adscendentibus; inflorescentia paniculata multiflora glabra; floribus hermaphroditis albis pedicellatis extus glabris intus minute tomentellis, perianthii tubo late obconico breve, lobis oblongo-ovatis; androecei seriebus 3 fertilibus, filamentis quam antheris brevioribus glabris, seriei III basi biglandulosis; antheris ovoideis vel oblongis; ovario ellipsoideo glabro stylum aequante.

Tree 10–15 meters high; branchlets sulcate-angled, fuscous, glabrous; petioles canaliculate, 3–6 mm. long, stout (1.5–3 mm. in diameter), glabrous; leaf-blades oblong or elliptic-oblong, 25–28 cm. long, 8.5–9.5 cm. broad, abruptly cuneate at base, long-acuminate at apex, narrowly cartilaginous at margins, chartaceous or subcoriaceous, olivaceous, glabrous on both surfaces, pinnate-veined, midnerve raised above, prominent beneath, secondary nerves 8–11 per side, arcuate-ascending, slightly raised on both surfaces, veinlets reticulate, subimmersed, inflorescence panicled, 4–7 cm. long, 2- or 3-times branched, about 100-flowered, branches of inflorescence rugose, glabrous, primary branches 3–20 mm. long; flowers hermaphrodite, white, in clusters of 2 or 3, pedicellate (pedicels glabrous, 1–3 mm. long, deciduously minutely bracteolate at base), about 3 mm. in diameter when mature; perianth tube broadly obconical, less than 1 mm. long, lobes 6, slightly imbricate, glabrous without, minutely white-tomentellous within and at margins, oblong-ovate, subacute, about 2 mm. long and 1.4 mm. broad; stamens 9, all fertile with 4-locular anthers; first and second series: filaments glabrous, 0.25–0.4 mm. long, eglandular, anthers oblong, about 0.6 mm. long and 0.5 mm. broad, obtuse at apex, locules introrse; third series: filaments glabrous, about 0.4 mm. long, each with 2 subsessile cordate-based glands about 0.5 mm. in diameter, anthers ovoid, about 0.6 mm. in diameter, locules extrorse-lateral; ovary ellipsoid, about 0.8 mm. long at anthesis, glabrous, style as long as ovary, stigma truncate.

Type, *KS 29843*, collected Sept. 26, 1929, in woods at Iquitos, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species allied to *O. fasciculata* (Nees) Mez and *O. minutiflora* O. C. Schmidt, from both of which it differs by its larger short-petioled leaves, its glabrous inflorescence, and its glabrous filaments. From the former it also differs by its shorter pedicels and lack of staminodes, from the latter by its larger flowers.

OCOTEA MAYNENSIS (Meissn.) Mez. PERU—Loreto: Mishuyacu, *Klug 883, 895, 943;* Balsapuerto, lower Río Huallaga basin, *KS 28390, 28401, 28597, 28604.* The last cited collections are from approximately the type locality; apparently it is not a rare species.

OCOTEA OPIFERA Mart. BRAZIL—Amazonas: Manáos, *KS 30071, 30134.* Probably fairly common in Amazonian Brazil.

OCOTEA DIELSIANA O. C. Schmidt. PERU—Loreto: Mishuyacu, *Klug 802, 991*. Collections from near the type locality.

Ocotea licanioides sp. nov. Arbor ca. 3 metralis; ramulis subteretibus dense fusco-tomentosis; petiolis subteretibus crassis tomentosis modo ramulorum; laminis oblongis coriaceis fuscescentibus, basi truncatis vel late cuneatis, apice subacutis (?), supra glabris vel dense pilosis ad nervos et paginam juvenilem, subtus persistenter villosis, nervo medio prominente, nervis lateralibus arcuato-adscendentibus supra planis subtus elevatis; inflorescentia ♂ graciliter paniculata multiflora dense fusco-villosa; bracteolis ovatis dense hirsutis deciduis; floribus ♂ breviter pedicellatis extus dense pilosis, perianthii deciduis; floribus ♂ breviter pedicellatis extus dense pilosis, perianthii tubo brevissimo, lobis ovatis, subacutis intus glabris vel basi breviter pilosis; androecei sereibus 3 fertilibus, filamentis glabris quam antheris brevioribus, seriei III basi biglandulosis; antheris oblongis apice truncatis vel leviter emarginatis; seriebus IV gynaeceoque defectis.

Tree about 3 meters high with drooping branches; branchlets subterete, densely fuscous-tomentose (hairs 1–2 mm. long, persistent); petioles subterete, 5–8 mm. long, stout (3–4 mm. in diameter), densely tomentose like the branchlets; leaf-blades oblong, 20–25 cm. long, 8–10 cm. broad, truncate or broadly cuneate at base, subacute (?) at apex, entire and slightly revolute at margins, thick coriaceous, fuscescent, above densely pilose on nerves and young surface (hairs about 1 mm. long), becoming glabrous, beneath uniformly villose with spreading hairs, pinnate-nerved, midnerve prominent on both surfaces, secondary nerves 10–12 per side, arcuate-ascending, nearly plane above, raised beneath, veinlets copiously reticulate, immersed above, raised beneath; ♂ inflorescence slenderly panicled, up to 7 cm. long on our specimen, once- or twice-branched, many-flowered, branches of inflorescence subterete, densely fuscous-villose, primary branches not more than 1 cm. long; bractlets ovate, densely hirsute, soon deciduous; flowers in clusters of 2–4, pedicellate (pedicels 1 mm. long or less, densely hirsute), densely pilose without (hairs appressed, about 0.3 mm. long); perianth tube small, not more than 0.5 mm. long, lobes 6, narrowly imbricate, subequal, ovate, subacute, about 2.5 mm. long and 1.8 mm. broad, glabrous within or short-pilose towards base; stamens 9, all fertile with 4-locular anthers; first and second series: filaments glabrous, slightly contracted, about 0.4 mm. long, eglandular, anthers oblong, about 0.9 mm. long and broad, truncate or lightly emarginate at apex, locules introrse; third series: filaments glabrous, about 0.5 mm. long, each with 2 subspherical sessile glands about 0.5 mm. in diameter; anthers oblong, about 0.8 mm. long and 0.7 mm. broad, lightly emarginate at apex, lower locules extrorse-lateral, upper locules lateral; fourth series and gynecium completely lacking.

Type, *Klug 1506*, collected May-June, 1930, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. It is a species related to *O. umbrosa* Mart., from which

it differs by its oblong leaves, shorter and glabrous filaments, and complete lack of a gynecium in the ♂ flowers, as well as in details of pubescence and dimensions.

OCOTEA LAXIFLORA (Meissn.) Mez. PERU—Loreto: Mishuyacu, *Klug 1486*. Our specimen has leaves larger than typical material of the widespread species, but is otherwise identical. The largest leaves are about 17 cm. long.

Ocotea Killipii sp. nov. Arbor ca. 9 metralis; ramis ramulisque gracilibus striatis decidue pilosis; petiolis leviter canaliculatis gracilibus subrugosis decidue pilosis; laminis ovato-oblongis chartaceis vel subcoriaceis, basi cuneatis, apice obtuse acuminatis, supra glabris, subtus decidue pilosis, nervo medio elevato, nervis lateralibus arcuato-adscendentibus; inflorescentia ♂ paniculata flexuosa multiflora subglabra subrugosa; floribus ♂ glabris breviter pedicellatis, perianthii tubo obconico breve, lobis ovato-oblongis, 3 exterioribus latioribus; androecei seriebus 3 fertilibus, serierum I et II filamentis brevissimis, seriei III filamentis antheras prope aequantibus; antheris oblongis apice truncatis; seriebus IV gynaeceoque defectis.

Tree 6–9 meters high with rounded crown; branches and branchlets dark brown, slender, striate, when young pilose (hairs pale, spreading, about 0.2 mm. long), becoming glabrous and nitid; petioles shallowly canaliculate, 7–15 mm. long, slender (1–1.5 mm. in diameter), subrugose, narrowly winged distally, deciduously pilose like the branchlets; leaf-blades ovate-oblong, 10–16 cm. long, 3.5–6.5 cm. broad, cuneate at base, bluntly acuminate at apex, entire and narrowly cartilaginous at margins, chartaceous when young, becoming subcoriaceous, dull green above, paler beneath, essentially glabrous above, when young pilose beneath (hairs pale, suberect, up to 0.3 mm. long, most numerous on veinlets, soon deciduous), venation pinnate, midnerve slightly raised on both surfaces, secondary nerves 4 or 5 per side, arcuate-ascending, copiously anastomosing near margins, veinlets copiously reticulate (ultimate obvious reticulations less than 1 mm. apart); ♂ inflorescence panicled, somewhat flexuose, 3–8 cm. long, 2- or 3-times branched, many-flowered (on our specimen 25–100-flowered), rachis and branches slender, essentially glabrous, subrugose, primary branches 3–20 mm. long, secondary branches, if present, up to 4 mm. long; flowers glabrous, dark green, short-pedicellate (pedicels up to 1.5 mm. long), 2–2.3 mm. long when mature; perianth tube obconical, about 1 mm. long, lobes 6, slightly imbricate, thin-carnose, 1–1.3 mm. long, the 3 exterior about 0.9 mm. broad, the 3 interior about 0.7 mm. broad; stamens 9, all fertile with 4-locular anthers, first and second series 0.8 mm. long, 0.5 mm. broad, with subsessile blunt introrsely-opening anthers, alternating with 6 minute triangular glands (?) about 0.3 mm. long, third series about 1 mm. long, 0.5 mm. broad, with stout filaments nearly as long as the anthers, anthers, blunt, opening extrorsely, fourth series and gynecium completely lacking; ♀ inflorescence and fruit not seen.

Type, *KS 23648*, collected May 30, 1929, in dense woods along Río Pinedo, north of La Merced, dept. Junín, Peru, alt. 700–900 m., and deposited in the herbarium of the New York Botanical Garden. Another collection from Peru is: Loreto: Masisea, on Río Ucayali, alt. 275 m., *KS 26861*. It is a species closely related to *O. laxiflora* (Meissn.) Mez, from which it differs by its smaller flowers, shorter pedicels, rounded perianth lobes, and eglandular third series of stamens. It is also related to *O. aniboides* Mez, from which it differs by having the inferior anther locules obvious and the connective not produced. It may be close to *O. architectorum* Mez, not available to me, which has tomentellous inflorescence and larger flowers.

OCOTEA MAROWYNENSIS (Miq.) Mez. PERU—Loreto: Mishuyacu, *Klug 127*. Previously known from Guiana. Our specimen differs noticeably from typical material by having the leaves about twice as broad and somewhat more coriaceous. However, in flower structure and form of inflorescence it is identical with Guiana specimens. I am unable to find any differences of specific consequence, and note the present collection as a broad-leaved form.

NECTANDRA PULVERULENTA Nees. PERU—Loreto: Mishuyacu, *Klug 1450*. Also collected by Tessmann in this approximate locality.

NECTANDRA LUCIDA Nees. PERU—Loreto: Yurimaguas, lower Río Huallaga, *KS 27709*. Several species closely related to this have been recently described by Schmidt, but our specimen seems best placed in *N. lucida*.

NECTANDRA LAEVIS Mez. PERU—Junín: Cahuapanas, on Río Pichis, alt. 340 m., *KS 26744*. A shrub 1–2 meters high, forming small thickets in this locality. Probably not rare throughout the region.

Pleurothyrium densiflorum sp. nov. Arbor ca. 10 metralis; ramis ramulisque subteretibus nigrescentibus crassis decidue sparse et minute cinereo-pulverulentis; petiolis canaliculatis gracilibus rugosis nigrescentibus subglabris; laminis oblongis vel elliptico-oblongis chartaceis, basi cuneatis, apice subacutis vel obtusis, supra glabris subtus subglabris, nervo medio prominente, nervis lateralibus patulis rectis adscendentibus ad marginem; inflorescentia paniculata multiflora minute cinereo-puberula; floribus hermaphroditis graciliter pedicellatis extus minute puberulis, perianthii tubo breve obconico, lobis oblongis apice rotundatis; androecei seriebus 3 fertilibus, filamentis quam antheris paullo brevioribus basi biglandulosis (glandulis magnis confluentibus); antheris oblongis vel subglobosis apice leviter emarginatis; ovario ellipsoideo rugoso quam stylo longiore.

Tree 8-10 meters high; branches and branchlets subterete, nigrescent, stout, when young sparsely and minutely cinereous-pulverulent, becoming

glabrous; petioles canaliculate, 7–15 mm. long, slender (1–2 mm. in diameter), rugose, nigrescent, essentially glabrous; leaf-blades oblong or elliptic-oblong, 13–18 cm. long, 4.5–6.5 cm. broad, cuneate at base, subacute or blunt at apex, entire and slightly recurved at margins, chartaceous, dull green, glabrous above, essentially glabrous beneath, venation pinnate, midnerve prominent on both surfaces, secondary nerves 10–14 per side, spreading, straight, ascending near margins, plane above, raised beneath, veinlets copiously reticulate; inflorescence panicled, copious from branchlets near apices, 4–6 cm. long, 2- or 3-times branched, many-flowered (probably 60–150-flowered), branches straight, striate, minutely cinereous-puberulous (hairs less than 0.05 mm. long, appressed, sparse), primary branches 3–5 mm. long; flowers hermaphrodite, yellow-green, 3–5 mm. in diameter, pedicellate (pedicels 3–6 mm. long), minutely cinereous-puberulous without; perianth tube obconical, about 1.3 mm. long, lobes 6, slightly imbricate, oblong, rounded at apex, about 2.5 mm. long and 1.5 mm. broad, slightly thickened at margins; stamens 9, all fertile with 4-locular anthers; first and second series: filaments 0.4–0.5 mm. long, anthers oblong, lightly emarginate at apex, 0.65 mm. long, 0.5 mm. broad, upper locules introrse-lateral, lower locules extrorse-lateral, glands 2 at base of each filament, forming with those of the next filament a confluent triangular mass about 0.8 mm. long and broad; third series: filaments stout, 0.4 mm. long, anthers subglobose, emarginate at apex, 0.5–0.6 mm. in diameter, upper locules introrse-lateral, lower locules extrorse, glands large, confluent with those of the outer series; ovary ellipsoid, rugose, about 1 mm. long and 0.6 mm. in diameter at anthesis, style about 0.5 mm. long, stigma truncate.

Type, *Klug 1372*, collected May–June, 1930, in forest at Mishuyacu, dept. Loreto, Peru, and deposited in the herbarium of the New York Botanical Garden. Another collection from the same locality is *Klug 1301*. It is a species most closely allied to *P. Poeppigii* Nees, from which it differs by its glabrous leaves with shorter petioles, its minutely gray-puberulous rather than ferruginous-tomentellous inflorescence, and its smaller flowers (about half as large) with oblong rounded rather than sub-lanceolate acute perianth lobes. From *P. chrysophyllum* Nees our species differs by its longer pedicels and filaments as well as by foliage characters.

NEW YORK BOTANICAL GARDEN

INDEX TO AMERICAN BOTANICAL LITERATURE

1929–1931

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in the broadest sense.

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